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Mobile Chemical Company, South Fort Meade Mine
Polk County, Florida

Engineering-Science, Inc.
Atlanta, GA

Prepared for

Environmental Protection Agency
Atlanta, GA

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U.S. Environmental Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

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16. Abstracts

Mobil Chemical Company has proposed an open pit phosphate mine, beneficiation plant and transshipment facility on a 16,288-acre site in southern Polk County, Florida. Mining would involve 15,194 acres, all of which would be reclaimed, and would produce 77 million tons of phosphate products over a 25-year period. The EIS examines alternatives, impacts and mitigative measures related to air, geology, radiation, groundwater, ecology and other natural and cultural systems.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET
ATLANTA, GEORGIA 30365

September 10, 1981

REF: 4SA-EIS

TO: ALL INTERESTED GOVERNMENTAL AGENCIES, PUBLIC GROUPS, AND CONCERNED INDIVIDUALS

The Draft Environmental Impact Statement for the Mobil Chemical Company South Fort Meade Phosphate Mine and Beneficiation Plant is enclosed for your review. This document has been prepared pursuant to Section 102(2)(c) of the National Environmental Policy Act (NEPA) (Public Law 91-190) and applicable EPA regulations at 40 CFR Part 6.9. A Supplemental Information Document has also been prepared which contains the supporting data related to the EIS. While the draft EIS is a complete document, much of the technical detail has been presented in the Supplemental Information Document (SID) to reduce the length of the DEIS, to make the DEIS more analytical than encyclopedic, and to make the DEIS more understandable to the non-technical public. The Draft EIS and the SID may be reviewed at the following locations:

- Lakeland Public Library, Lakeland, Florida
- Bartow Public Library, Bartow, Florida
- Ausley Memorial Library, Wauchula, Florida
- Selby Public Library, Sarasota, Florida
- Manatee County Library System, Bradenton, Florida
- Tampa-Hillsborough County Public Library, Tampa, Florida

A public hearing to discuss this project has been scheduled for October 20, 1981, at 7:30 p.m. in the Bartow County Civic Center, located at 2250 Floral Avenue, Bartow, Florida. Persons may begin to register at 7:00 p.m.

Persons wishing to make comments should attend and speak at the hearing. A verbatim transcript will be made of this public hearing. The hearing chairman may request that lengthy or technically complex statements be summarized and that, to ensure accuracy of the record, such statements be submitted in writing to:

Ms. A. Jean Tolman
EIS Project Officer
Environmental Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

The hearing record will remain open and additional written comments may be submitted through November 2, 1981. Such additional comments will be considered as if they had been presented at the public hearing.

Recipients of this document should be aware that EPA will not reprint the material contained in the DEIS for the Final EIS. The Final EIS will consist of the Agency's statement of findings, any pertinent additional information or evaluations developed since publication of the Draft EIS, comments on the project and the Agency responses, and the transcript of the public hearing.

Please bring this notice to the attention of all persons who may be interested in this matter.

Sincerely yours,

John A. Little, Deputy

for Charles R. Jeter
Regional Administrator

Enclosure: DEIS

United States
Environmental Protection
Agency

Region 4
345 Courtland Street, NE
Atlanta, Ga 30365

EPA 904/9-81-075
September, 1981

PB82-106881

EPA

Environmental Impact Statement

Draft

Mobil Chemical Company South Fort Meade Mine Polk County, Florida

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA 22161

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

for

Proposed Issuance of a New Source National Pollutant Discharge Elimination System Permit

to

Mobil Chemical Company
South Fort Meade Mine
Polk County, Florida

prepared by:

U.S. Environmental Protection Agency
Region IV, Atlanta, Georgia 30365

cooperating agencies:

U.S. Army Corps of Engineers
Jacksonville District
Jacksonville, Florida 32201

U.S. Department of the Interior
Bureau of Land Management
Eastern States Office
Alexandria, Virginia 22304

Mobil Chemical Company has proposed an open pit phosphate mine, beneficiation plant and transshipment facility on a 16,288-acre site in southern Polk County, Florida. Mining would involve 15,194 acres, all of which would be reclaimed, and would produce 77 million tons of phosphate products over a 25-year period. The EIS examines alternatives, impacts and mitigative measures related to air, geology, radiation, groundwater, ecology and other natural and cultural systems.

Comments will be received through November 2, 1981. Comments or inquiries should be directed to:

A. Jean Tolman, EIS Project Officer
U.S. Environmental Protection Agency - Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365
(404) 881-7458

approved by:

John A. Little, Deputy for
Charles R. Jeter
Regional Administrator

August 31, 1981
Date

Summary Sheet
for
Environmental Impact Statement

Mobil Chemical Company
South Fort Meade Phosphate Mine

(X) Draft
( ) Final

U.S. Environmental Protection Agency, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

1. Type of Action: Administrative (X) Legislative ( )

2. Description of Action:

Mobil Chemical Company (Mobil) is proposing to construct and operate a phosphate mine and beneficiation plant in Polk County, Florida. The EPA Region IV Administrator has declared the proposed facilities to be a new source as defined in Section 306 of the Federal Clean Water Act.

In compliance with its responsibility under the National Environmental Policy Act (NEPA) of 1969, EPA Region IV has determined that the issuance of a new source National Pollutant Discharge Elimination System (NPDES) permit for the proposed mining and beneficiation facility (the South Fort Meade Mine) would constitute a major Federal action significantly affecting the quality of the human environment. Therefore, this Environmental Impact Statement has been prepared in accordance with the requirements of NEPA and EPA regulations at 40 CFR Part 6. EPA will issue, issue with conditions, or deny issuance of the NPDES permit based on the review of the permit application and the findings of this EIS.

The applicant's proposed mining operation, the South Fort Meade Mine, would produce 77 million tons of wet phosphate rock over the 25-year life of the mine. A total of 15,194 acres of the 16,288-acre tract would be disturbed during mining. The mine would be designed to produce approximately 3.4 million tons of phosphate rock annually and would be developed in two phases. Phase I is scheduled to start up in 1984 following a 21-month construction period. Phase I operations, with an estimated capacity of 1.7 million tons per year, would include one dragline and an associated beneficiation plant. The start up of Phase II is planned for 1987 following a similar 21-month construction interval. Facilities comparable to Phase I would be developed in Phase II, increasing production capacity to 3.4 million tons per year.

Equipment and procedures similar to those presently used in Mobil's two Florida phosphate mines are proposed for the new facility. Land clearing would involve harvesting or burning the vegetation on 50-acre parcels in advance of the mining operation. When in full production, two large walking draglines would operate simultaneously, mining and extracting phosphate from separate areas. Ore would be slurried and hydraulically transported in pipelines to the beneficiation plant for washing to separate pebble product, clay and fines, and for flotation to recover additional phosphate product. Wet rock would be stored in on-site stockpiles or loaded directly onto railroad cars for transport to Mobil's existing rock-drying facilities in Nichols, Florida.

Waste clay and sand tailings from the beneficiation plant would be redeposited on the property in clay impoundment areas and sand tailings backfill areas. Mobil's proposed action includes utilizing the conventional clay settling technique for waste disposal and reclamation. The initial waste clay settling areas would be built on unmined ground with dikes constructed of overburden material. These settling areas, totaling 1,320 acres, would hold the waste clays generated during the first four years of mining. All other waste disposal areas would be constructed on mined land. The waste disposal plan proposed by Mobil calls for 8,170 acres of above-grade clay settling areas, 1,513 acres of below-grade clay settling areas, 5,034 acres of below-grade sand tailings fill areas with overburden cap, and 308 acres of overburden fill areas. Sand tailings would be used to cap 1,489 acres of above-grade clay settling areas.

Water uses and estimated flow requirements for the South Fort Meade Mine are identified as follows: slurry water for slurrying and transporting the ore from the mining area to the beneficiation plant (27.0 mgd), seal water for transfer pumps (0.691 mgd), washing/dilution water for the washing facilities (52.0 mgd), rinsing water for the feed preparation process (38.0 mgd), process water for flotation (55.9 mgd), and miscellaneous potable water (0.022 mgd). Most water required would be supplied from the recirculation system (157.2 mgd). Groundwater would be used to supply water to the flotation process (12.3 mgd) and for makeup water (3.4 mgd), pump seal water (0.691 mgd) and potable water (0.022 mgd). The total consumptive use of groundwater is projected to be 16.413 mgd.

Approximately seven percent of the site (1,094 acres) would not be disturbed by the proposed mining operation. These undisturbed areas include 111 acres of freshwater swamp, 21 acres of freshwater marsh, 3 acres of surface water (ponds), 664 acres of upland hardwood forest, 182 acres of cutover forest, 108 acres of improved pasture and 5 acres of upland mixed forest.

The mined areas would be used for waste disposal, with sequential reclamation following completion of the waste disposal activities in each disposal area. The entire reclamation program would be completed 10 years after mining has ceased (mine year 35). Mobil's proposed plan provides for the reclamation of approximately 60,000 linear feet of stream channels and 1,912 acres of wetlands on the site. The reclaimed stream channels would replace the disturbed tributaries of the Peace River and Bowlegs Creek. The reclaimed site would contain 11,521 acres of improved pasture, 182 acres of cutover flatwoods, 664 acres of upland hardwood forest, 1,276 acres of upland mixed forest, 453 acres of planted pine, 3 acres of surface water areas (ponds), 277 acres of forested stream channel, 589 acres of freshwater swamp, and 1,323 acres of freshwater marsh.

3. Alternatives Considered:

Mobil's proposed mining and beneficiation operation is comprised of a number of individual mining subsystems that, when combined, provide a total project capable of satisfying Mobil's objectives. The identifiable subsystems included in the Mobil project are as follows:

Mining Method
Matrix Transfer
Matrix Processing
Waste Disposal
Reclamation
Water Sources
Plant Siting
Water Discharge
Product Transport

Various methods (i.e., alternatives) are available to satisfy the objectives of each of these subsystems. The subsystems, objectives and alternatives are identified in the following chart, and a brief description of each alternative is presented in the succeeding paragraphs.

Mining Subsystem	Objective	Alternatives Considered
Mining Method	Remove overburden and deliver matrix to a transport system.	Dragline* Bucket Wheel Dredge
Matrix Transfer	Transport matrix from the mine to the beneficiation plant.	Pipeline* Conveyor Belt Truck
Processing	Process the matrix to separate the phosphate rock product from the waste sand and clay.	Conventional Beneficiation* Dry Separation
Waste Disposal	Dispose of the waste sand and clay generated by matrix processing.	Conventional Clay Settling Case* Sand/Clay Cap Case Sand/Clay Mix Case Overburden Mix Case
Reclamation	Return the mined site to unrestricted land use potential.	Conventional Plan* Sand/Clay Cap Plan Sand/Clay Mix Plan Overburden Mix Plan
Water Sources	Provide a continuous source of fresh water (about 16 mgd) for use in matrix processing and as makeup for losses in the recirculation system.	Groundwater* Surface Water
Plant Siting	Provide location which conserves energy and avoids environmentally sensitive areas.	Gilshey Branch Site* Other On-Site Locations
Water Discharge	Provide location for clear water pool discharge.	Peace River* Bowlegs Creek
Product Transport	Move wet rock to existing drying facilities.	Railroad* Truck

* Mobil's proposed action

Mining Method

Dragline Mining: Mobil proposes to use two 45-cubic yard draglines for removing the overburden and mining the phosphate matrix. Both draglines would operate independently, removing overburden and matrix in two separate mining areas. This is the conventional mining method used by the Florida phosphate industry.

Bucket Wheel: A bucket wheel excavator has a large rotating wheel with fixed buckets attached on its periphery. The bucket wheel excavator would excavate material and discharge it onto an associated conveyor belt system. Four bucket wheel excavators would be required for the proposed mine operation; two of the units would remove overburden while the other two units mined the matrix.

Dredge: The dredge unit consists of equipment mounted on a barge for floating and moving over the material to be excavated. The cutterhead dredge, considered the dredge unit best suited for mining phosphate in the central Florida area, would excavate and pump materials from beneath the water to the surface via a suction pipe. The South Fort Meade site would require two cutterhead dredge units to remove overburden and mine the matrix.

Matrix Transfer

Pipeline: The mined ore would be dumped by the dragline into a slurry pit for disaggregation. Recirculation water (27 mgd) would be directed by hydraulic guns to break up the material and slurry the matrix to a pumpable mixture. Each mining operation would have a separate slurry system with booster pumps to deliver the slurry to the plant. This is the conventional matrix transfer method used in the Florida phosphate industry.

Conveyor Belt: A conveyor belt system would begin at the field feed hopper. Ore would have to be transported from the mine area to the feed hopper. From the hopper, the ore would be placed on the conveyor belt to be transported to the beneficiation plant. Two independent 36-inch conveyor systems would be required to transfer the ore from the two mining areas to the beneficiation plant.

Truck: Matrix transfer by diesel engine truck could be accomplished during Phase I with 25-ton capacity trucks making 820 round trips per day. During Phase II, 1,640 truck trips per day would be necessary using trucks with a 25-ton capacity.

Processing

Conventional Beneficiation: Conventional beneficiation operations at the mine would include washing, feed preparation and flotation, each with the purpose of separating phosphate rock from the associated organics and gangue minerals (limestone cobbles, quartz sand and a mixture of clay minerals). This is the only matrix processing method used in the Florida phosphate industry today.

Dry Separation: Dry separation is a process that involves drying, crushing and sizing. After being dried with a rotary kiln and crushed with a hammermill, the matrix would be processed through several stages of air separation to separate the pebble product from the finer materials. Additional phosphate product would then be separated from the remaining material by an electrostatic separator.

Waste Disposal

Conventional Clay Settling Case: Mobil proposes to use the conventional method of waste disposal as currently practiced at their existing mining operations in central Florida. The conventional plan calls for the separate disposal of sand tailings and waste clay. The sand tailings would principally be used to backfill mined areas (5,034 acres) and as fill in dike construction for clay impoundment areas. Waste clays would be contained behind earthen dams to be constructed on natural ground (1,320 acres) and in mined areas (8,363 acres). A flow-through settling technique is commonly used with conventional clay settling and would be implemented at the South Fort Meade Mine. This technique is generally utilized for clay settling basins that are located adjacent to each other. The procedure consists of introducing the waste clay stream into a series of clay settling basins instead of a single basin, with all connected basins remaining active until the last basin is filled and inactivated. The purpose of the flow-through technique is to achieve improved water clarification, clay compaction, and water management. Average dike height for this waste disposal case would be 38.7 feet above grade.

Sand/Clay Cap Case: The sand/clay cap case would have above-grade clay settling basin configurations similar to the conventional case; however, flow-through settling would not be used with the sand/clay cap disposal method. A five foot thick sand/clay cap (sand to clay ratio of 4:1) would be placed on top of the clay settling areas (7,580 acres). In order to place the sand/clay cap over the settling areas in a timely fashion, the basins would be taken out of service after the initial fill and actively dewatered to develop a crust. The average dike height for this case would be 36.7 feet. This waste disposal case also calls for 1,513 acres of below-grade clay settling basins partially capped with overburden, 590 acres of above-grade clay settling basins capped with overburden, 5,079 acres of sand tailings fill areas capped with overburden, and 308 acres of overburden fill areas.

Sand/Clay Mix Case: The sand/clay mix waste disposal method would involve mixing gravity-thickened clays with dewatered sand tailings and depositing the mixture in mined areas for consolidation and stabilization. The clays would be pumped from the settling/thickening areas to the mix and disposal sites. Sand to clay ratios of approximately 2:1 have been shown in experimental studies to be the minimum acceptable for achieving significant consolidation benefits. The high clay content and correspondingly low proportion of sand in the South Fort Meade Mine matrix preclude the use of sand/clay mix waste disposal techniques for the entire site. A combination of sand/clay mix areas (3,512 acres), clay settling areas with a 2:1 sand/clay cap (3,185 acres), graded spoil and overburden fill areas (1,571 acres), sand tailings fill areas (3,020 acres) and conventional clay settling areas (3,737 acres) would have to be utilized to dispose of the wastes. The average dike height for this case would be 35 feet.

Overburden/Clay Mix Case: Since sufficient sand tailings are not available from the matrix to accomplish a 2:1 sand/clay mix over the entire site, overburden sand could be used as an additional source of sand to mix with the waste clay. The overburden would be slurried and pumped to a field washer for screening and washing. The recovered overburden sand would then be pumped to the mixing station where it would be combined with thickened waste clay in a 2:1 sand to clay mixture for final disposal. This waste disposal case would result in sand tailings fill areas (3,020 acres), 2:1 sand/clay mix areas (5,492 acres), above-grade clay settling areas capped with 2:1 sand/clay mix (2,847 acres), below-grade clay settling areas (2,095 acres) and overburden fill areas (1,740 acres). The average dike height for this case would be 38 feet.

Reclamation

Conventional Plan: Mobil's reclamation plan would reclaim the 15,194 acres disturbed by mining as follows: improved pasture (11,413 acres) would be developed on above-grade clay settling areas and sand tailings fill areas with overburden cap; upland mixed forest (1,271 acres), planted pine (453 acres) and forested stream channel (277 acres) would be developed in sand tailings fill areas with overburden cap; freshwater swamp (478 acres) would be developed in above-grade clay settling areas; and freshwater marsh (1,302 acres) would be developed in below-grade clay settling areas capped with overburden.

Sand/Clay Cap Plan: This plan would reclaim the 15,194-acre disturbed area as follows: improved pasture (11,003 acres) would be developed in above-grade clay settling areas capped with 4:1 sand/clay mix and sand tailings areas capped with overburden; upland mixed forest (1,451 acres), planted pine (536 acres), and forested stream channel (279 acres) would be developed in sand tailings capped with overburden; freshwater swamp (504 acres) would be developed in above-grade clay settling areas capped with 4:1 sand/clay mix; and freshwater marsh (1,421 acres) would be developed in below-grade clay settling areas capped with overburden.

Sand/Clay Mix Plan: This plan would reclaim the 15,194-acre disturbed area as follows: improved pasture (10,313 acres) would be developed in above-grade sand/clay mix (2:1) areas, clay settling areas, and sand tailings capped with overburden; upland mixed forest (1,826 acres), planted pine (431 acres), and forested stream channel (263 acres) would be developed in sand tailings capped with overburden; freshwater swamp (746 acres) would be developed in clay settling areas and in above-grade and below-grade sand/clay mix (2:1) areas; and freshwater marsh (1,615 acres) would be developed in below-grade clay settling areas partially capped with overburden.

Overburden/Clay Mix Plan: This plan would reclaim the 15,194-acre disturbed area as follows: improved pasture (10,313 acres) would be developed in sand/clay mix areas and sand tailings capped with overburden; upland mixed forest (1,826 acres), planted pine (431 acres), and forested stream channel (263 acres) would be developed in sand tailings capped with overburden; freshwater swamp (746 acres) would be developed in above-grade and below-grade sand/clay mix areas; and freshwater marsh (1,615 acres) would be developed in below-grade clay settling areas partially capped with overburden.

Water Sources

Groundwater: Mobil proposes to utilize three deep wells (approximately 1,000 feet deep) for the primary source of clean water for the flotation process and as makeup water for the recirculation system. The Southwest Florida Water Management District has granted a Consumptive Use Permit (CUP) for the withdrawal of 16.413 mgd of groundwater (15.7 mgd from the Lower Floridan and 0.713 mgd from the Upper Floridan Aquifer).

Surface Water: The 7-day, 10-year low flow in Bowlegs Creek is zero mgd while that in the Peace River is 7.1 mgd. Since neither is sufficient to meet the daily water requirements (16.423 mgd) of the mine, this alternative would require that an impoundment be constructed on Bowlegs Creek. This source of water would probably require treatment to upgrade the quality and could require augmentation by groundwater withdrawal.

Plant Siting

Gilshey Branch Site: Mobil proposes to locate the beneficiation plant on the west side of Manley Road approximately two miles north of County Line Road. Mobil's main objective in siting the plant was to minimize the energy required for matrix transfer by locating at the centroid of matrix pumping.

Other On-Site Locations: The proposed mine site was examined for other potential locations for the beneficiation plant. Objectives followed in attempting to locate other sites were to maximize energy efficiency and minimize disturbance of environmentally sensitive areas.

Water Discharge

Peace River: Under Mobil's proposed action the clear water discharge would gravity flow into the Peace River by way of a vegetated drainage swale (outfall ditch) located along the railroad route and draining to the Peace River. The mining operation would have an intermittent discharge from the clear water pool primarily between the months of May and October. The discharged volume would be directly dependent on local rainfall trends and is expected to be the greatest between June and September, a period when tropical storms are frequent in Florida. During the wet season the normal and maximum discharge volumes would be 9 mgd and 20 mgd, respectively.

Bowlegs Creek: Construction of a pump station and a transfer line from the clear water pool to Bowlegs Creek would be necessary in order to implement the alternative of discharging into Bowlegs Creek.

Product Transport

Railroad: Mobil proposes to transfer the wet phosphate rock produced at South Fort Meade by rail cars to an existing rock-drying facility at Nichols, Florida. Mobil would construct a six-mile rail spur from the plant site west to the existing Seaboard Coast Line track. This would also require construction of a bridge across the Peace River and a grade crossing on Mt. Pisgah Road. During full production, 65 rail cars would be pushed from the beneficiation plant to the main track and returned twice each day.

Truck: Product transport by diesel truck could be accomplished during full production with 25-ton capacity trucks making 520 round trips per day from the South Fort Meade Mine to Nichols.

The No Action Alternative

The no action alternative by EPA would be the denial of an NPDES permit for the proposed project. The effect of permit denial would be to precipitate one of three possible actions on the part of Mobil: (1) termination of the proposed project, (2) indefinite postponement of the proposed project, or (3) restructuring of the project to achieve zero discharge.

Termination of the planned project would allow the existing environment to remain undisturbed, and the gradual socioeconomic and environmental trends would continue as at present.

The project might be postponed for an indefinite time and then successfullly pursued by Mobil or another mining company. This might be expected to occur when high grade phosphate reserves are depleted and the resource retained on the site becomes extremely valuable strategically as well as economically.

If EPA denies the NPDES permit, Mobil could still execute a mining project provided the project could be performed with zero discharge. Under zero discharge conditions, neither an NPDES permit nor an Environmental Impact Statement would be required.

4. EPA's Preferred Alternatives

The alternatives evaluation for the Mobil project is presented in detail in Section 2.0 of the DEIS. Based on analyses described in that section, the environmentally preferable alternative, EPA's preferred alternative, and Mobil's proposed action (including mitigating measures presented as part of the proposed action), all coincide with respect to the following project subsystems:

Mining Method (Dragline)
Matrix Transfer (Pipeline)
Processing (Conventional Beneficiation)
Water Sources (Groundwater Withdrawal)
Plant Siting (Gilshey Branch Site)
Water Discharge (Peace River)
Product Transport (Railroad)

However, they differ with respect to the waste disposal and reclamation project plans. The analysis of waste disposal and reclamation alternatives identified the 4:1 sand/clay cap waste disposal case and the corresponding reclamation plan as the environmentally preferable (and therefore EPA's preferred) alternatives. A summary of the evaluation of waste disposal and reclamation alternatives is presented in Table 1.

TABLE 1

SUMMARY OF WASTE DISPOSAL AND RECLAMATION ALTERNATIVE EVALUATION

Item	Conventional Clay Settling Plan	Sand/Clay Cap Plan	Sand/Clay Mix Plan	Overburden/ Clay Mix Plan
Average Dike Height of Above-Grade Basins (feet)	39	37	35	38
Area of Above-Grade Settling Basins, clay and/or sand/clay mix (acres)	8,170	8,170	8,339	8,339
Area of Above-Grade Clay Settling Basins, (capped or uncapped)	8,170	8,170	4,827	2,847
Area of Above-Grade Clay Settling Basins, without cap (acres)	6,681	0	1,642	0
Areas of Sand Tailings and Overburden Fill (acres)	5,511	5,511	4,760	4,760
Areas of Below-Grade Settling Basins (acres)	1,513	1,513	2,095	2,095
Land Use Potential Rating (Existing = 10)				
a. Structural Stability (Short-Term)	5.1	5.3	4.8	4.9
b. Structural Stability (Long-Term)	5.6	6.4	5.6	5.8
c. Agronomic Value	5.8	7.7	6.7	6.9
Phosphate Resources in Waste Disposal Areas, with clay (ratio of phosphate to waste material)	0.44	0.35	0.24	0.15
Average Soil Radium-226 Levels of Reclaimed Landform (pCi/g)	13.2	8.9	10.9	8.9
Groundwater Consumption (mgd)	16.4	16.4	16.2	16.4+
Dike Failure Risk Rating (4 = Highest Potential)	4	1	3	2
Reclaimed Wetland Areas and Reforested Stream Channels (acres)	2,057	2,204	2,624	2,624
Reclaimed Upland Mixed Forested Areas (acres)	1,271	1,451	1,826	1,826
Energy Consumption for Pumping (10^6 kWh)	1,004	1,252	1,358	2,444
Technology Risks (number of processes or operations not proven)	0	1	1	2
Possibility of Contamination by Seepage from basins to groundwater (4 = Greatest Probability)	1	2	3	4
Reduction in Aquifer Recharge (3 = Greatest Reduction)	3	3	2	1

SOURCE: STUDY DATA

The EPA preferred alternatives for waste disposal and reclamation have the principal advantages of a lower (by two feet) average dike height, reduced surface radiation levels, improved agronomic properties of the reclaimed soils, establishment of a perched water table about five feet below the surface of the reclaimed sand/clay cap areas (providing a plant growth zone), reduced potential for dam failure because of decreased active settling acreage, seven percent more reclaimed wetlands, and improved land use potential with the 4:1 sand/clay mix cap over the clay settling areas due to increased structural stability. Mobil's proposed action for waste disposal and reclamation has the principal advantages of significantly lower energy consumption and the use of proven technology.

5. Mitigation Measures Recommended by EPA

In addition to identifying the environmentally preferable alternatives for the project subsystems, EPA's assessment has focused on developing mitigating measures, not already a part of the proposed action, which could minimize adverse impacts of the project. These are discussed in detail in Section 2.11 of the DEIS. EPA has determined that the following mitigation measures should be incorporated into the proposed phosphate mining project.

> The practice of high-profile overburden stacking to the maximum extent compatible with toe spoiling of the leach zone.
>
> A program to reduce impacts on the indigo snake by capturing and relocating indigo snakes on the site to other suitable habitats in the region.
>
> A program to evaluate and reduce any potential impacts to the bald eagle nesting approximately 3/8 mile outside the mine site.
>
> A monitoring program to assess the wetlands restoration and re-creation effort to be undertaken at the mine site.
>
> A program to monitor the Shallow Aquifer to assess the effectiveness of the perimeter ditches in preventing dewatering of preserved areas.

6. Summary of the Environmental Impacts of the Alternatives

In order to make its determination regarding the NPDES permit application for the Mobil project, EPA has developed a comparison between (1) Mobil's Proposed Action, (2) EPA's preferred alternatives and recommended mitigating measures, and (3) the no action alternative of permit denial by EPA, which could lead to termination of the project, postponement of the project or restructuring of the project to achieve zero discharge. This comparative analysis is presented in Table 2 (page S-14).

7. EPA's Proposed Action

After careful consideration of these alternatives, EPA proposes to issue an NPDES permit to Mobil for their proposed South Fort Meade Phosphate Mine. The project authorized by the permit is to be the sum of EPA's preferred subsystem alternatives (which is Mobil's proposed action except in the case of waste disposal and reclamation). Further, EPA proposes to impose as permit conditions all the mitigating measures identified as part of Mobil's proposed action (Section 2.1 of the DEIS and Chapter 2 of the SID) as well as all the mitigating measures recommended by EPA (Section 2.11 of the DEIS).

TABLE 2

COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES

			The No Action Alternatives		
Discipline	Mobil's Proposed Action	EPA's Preferred Alternatives Including Mitigation Measures	Termination	Postponement	Achieve Zero Discharge
Air Quality, Meteorology, and Noise	Minor increases in fugitive dust emissions and emissions from internal combustion engines; minor emissions of volatile reagents; increased noise levels in the vicinity of operating equipment.	Same as Mobil's proposed action.	No change in meteorology & noise levels; possible air quality changes from other sources.	Same as Mobil's proposed action.	Same as Mobil's proposed action.
Geology and Soils	Disruption of the surface soils and overburden strata; removal of 77 million tons of phosphate rock; increased loading to the Hawthorn of 17 psi; altering of site topography; creation of approximately 7000 A of structurally and agronomically inferior land.	Same as Mobil's proposed action except: increased loading to Hawthorn Formation of 16 psi; alteration to topography not as great (2 ft. less); possible further decrease in level of CS-10; slightly increase future effort to recover phosphate from waste clay; improved structural and agronomic characteristics over the approximately 7000 A of land.	No change in geology; no change in site soils; preservation of 77 million tons of phosphate rock reserves.	Possible increased phosphate recovery and more effective waste disposal, reclamation, and wetlands restoration.	Increased dike heights and water storage capacity; infringement on Bowlegs Creek preserved area; less desirable reclamation plan.
Radiation	Disruption of the natural distribution of radioactive material within the overburden and matrix; increased gamma radiation levels from reclaimed surfaces and increased soil radioactivity.	Same as Mobil's proposed action, except that reclaimed surfaces would have lower overall soil radioactivity and gamma radiation levels.	No change in radiation characteristics of the site.	Same as Mobil's proposed action.	Probable increase in area covered with waste clays - the reclaimed material having the highest radioactivity levels.
Groundwater	Lowering of the piezometric surface of the Lower Floridan Aquifer; lowering of the Surficial Aquifer near active mine pits; 47 percent reduction in natural recharge.	Same as Mobil's proposed action, except that a perched water table would be established about 5 feet below the surface in the reclaimed sand/clay cap areas.	No change in existing groundwater quantity or quality.	Possible reduction in groundwater withdrawals because of more effective dewatering of waste materials resulting from future process development.	Possible reduction in groundwater withdrawals because of increased water storage.
Surface Water	Disruption of surface water flows from the mine site; minor alteration in flows following reclamation; degradation of water charges from the mine water system.	Same as Mobil's proposed action, except that dam failure potential is reduced because of decreased active settling areas and 2-foot lower dike heights.	No change in surface water quantity; surface water quality would be dependent upon future land uses in the area.	Same as Mobil's proposed action.	Eliminaton of surface water quality impacts resulting from discharge from mine water system; increased probability of dike failure impacts.
Biology	Destruction of aquatic and terrestrial habitats on the mine site; aquatic habitat modification due to reduced surface water flows and addition of contaminants; loss of some endangered species individuals; creation of modified habitats following reclamation.	Same as Mobil's proposed action, except 8 percent more wetlands would be reclaimed, improved soils for restoration of vegetation and habitats, and greater protection of listed species.	No change in existing aquatic or terrestrial ecology.	Possibly more effective reclamation.	Elimination of habitat modification resulting from mine water discharge; increased probability of dike failure impacts; probable increase in reclaimed land areas (waste clays) of limited use (pasture).
Human Resources	Retention of existing jobs and development of new jobs with comparatively high income; ad valorem and sales tax revenue for Polk County; severence tax revenue for the state Land Reclamation Trust Fund, and Florida Institute of Phosphate Research; maintain employment for Mobil's Fort Meade personnel.	Same as Mobil's proposed action, except land use potential improved by 4:1 sand/clay cap surface soil over clay settling areas.	Loss of jobs which would be generated by the project; loss of tax revenue for Polk County and the state; and a loss of Mobil's investment.	Potential increased project costs; loss of jobs.	Same as Mobil's proposed action.

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1.0 PURPOSE AND NEED FOR ACTION

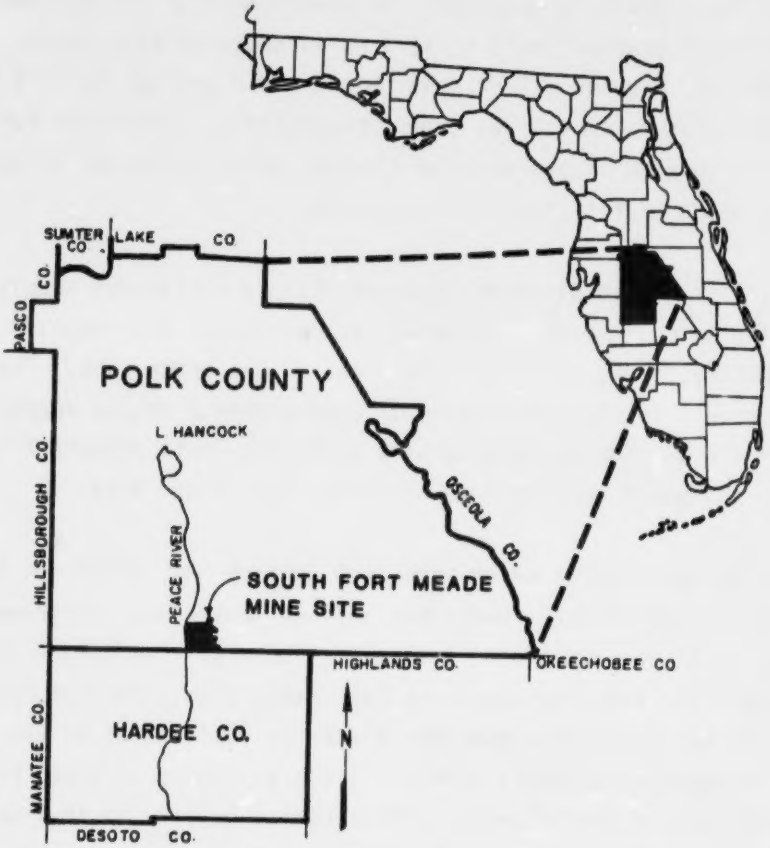
Mobil Chemical Company mines, processes and ships phosphate ore in the central Florida area. Mobil currently operates the Fort Meade mine located in Polk County, Florida. Mobil is proposing the development of new phosphate mining, beneficiation and transshipment facilities in southern Polk County, Florida. The new facility, the South Fort Meade Mine, would replace Mobil's Fort Meade Mine when the phosphate reserves there are depleted. The South Fort Meade Mine would be located on approximately 16,300 acres lying ten miles southeast of the Fort Meade Mine (Figure 1.0-A, 1.0-B).

This new facility would allow Mobil to maintain a continuous supply of phosphate ore to its customers. The annual production of the proposed facility, at full capacity, would be 3.4 million tons of phosphate rock. The development would result in the disturbance of approximately 15,200 acres of the 16,300-acre tract. The proposed mining operation would produce 77 million tons of wet phosphate rock over the 25-year life of the mine.

As required by the Federal Water Pollution Control Act, which was amended by the Clean Water Act of 1977, Mobil has applied to the U.S. Environmental Protection Agency (EPA) for a National Pollution Discharge Elimination System (NPDES) permit for the proposed South Fort Meade Mine. The EPA Regional Administrator has determined that the discharge constitutes a "new source" requiring issuance of an NPDES permit. The granting of an NPDES Permit is a major Federal action significantly affecting the quality of the human environment. Therefore, EPA is required by the National Environmental Policy Act of 1969 (NEPA) to prepare an Environmental Impact Statement (EIS) for Mobil's South Fort Meade Mine. This draft EIS has been prepared by a third party contractor under the direction and review of EPA, Region IV.

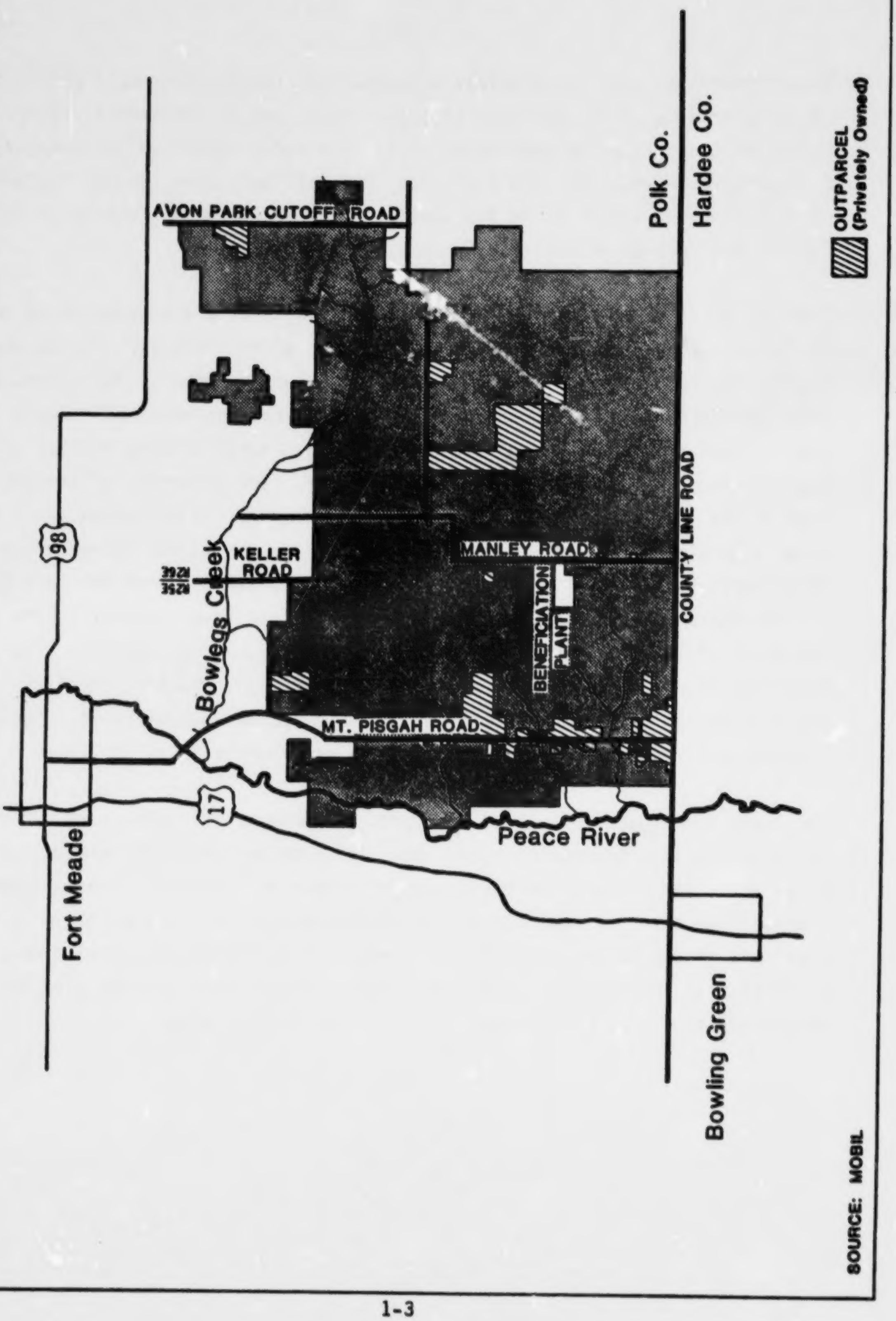
FIGURE 1.0-A

LOCATION OF PROPOSED SOUTH FORT MEADE MINE SITE


SUMTER CO
LAKE CO
PASCO CO.
POLK COUNTY
L. HANCOCK
HILLSBOROUGH CO.
PEACE RIVER
SOUTH FORT MEADE MINE SITE
OSCEOLA CO.
HIGHLANDS CO.
OKEECHOBEE CO
HARDEE CO.
MANATEE CO.
DESOTO CO.
N

SOURCE: MOBIL

SPECIFIC SITE LOCATION OF PROPOSED SOUTH FORT MEADE MINE


AVON PARK CUTOFF ROAD
Polk Co.
Hardee Co.
OUTPARCEL (Privately Owned)
98
KELLER ROAD
3921
3521
Bowlegs Creek
MANLEY ROAD
COUNTY LINE ROAD
BENEFICIATION PLANT
MT. PISGAH ROAD
17
Peace River
Fort Meade
Bowling Green

SOURCE: MOBIL

The proposed project also requires a Section 404 (Dredge and Fill) permit from the U.S. Army Corps of Engineers (ACOE) as specified by the Federal Water Pollution Control Act Amendments of 1972. The ACOE, Jacksonville District, is a cooperating agency for this EIS. The ACOE will determine whether issuance of a Section 404 permit is in the public interest following issuance of this EIS and publication of notice.

Finally, the proposed project requires the issuance of a phosphate lease from the Bureau of Land Management (BLM), Department of the Interior, for approximately 880 acres within the 16,300-acre site owned by Mobil. The Federally owned phosphate reserves under these 880 acres have been retained through patent reservations and may be leased under the Mineral Leasing Act for Acquired Lands of 1947, 30 USC, Section 351-359. The authority of the Secretary of the Interior, pertaining to phosphate leasing, is contained in 43 CFR, Group 3500 (Leasing of Minerals Other than Oil and Gas). The Bureau of Land Management, Eastern States Office, is also a cooperating agency for this EIS. The Department of Interior will determine whether to issue mineral leases for 880 acres within the site of the proposed mine addressed by the EIS. The Bureau of Land Management will make its determination regarding the lease application and may incorporate into the lease special stipulations to assure protection of non-mineral resources and the environment.

The South Fort Meade Mine would encompass approximately 17,082 acres, all lying within Polk County, Florida. The mine plan presented in this DEIS is based on 16,288 acres which Mobil currently owns or controls. The railroad right-of-way owned by Mobil covers an additional 12 acres. The remaining 782 acres are privately owned and Mobil is negotiating the acquisition of this property with the owners. Some owners have granted Mobil written permission to include their land in the permitting effort for the mine.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 GENERAL DESCRIPTION OF MOBIL'S PROPOSED ACTION

Mobil has designed an integrated plan for mining and processing phosphate rock at the proposed South Fort Meade Mine. Mobil's proposed action is comprised of individual mining subsystems that, when combined, provide a total system capable of meeting Mobil's production objectives. The mining subsystems necessary for the South Fort Meade operation are shown below.

Mining Subsystem

- Mining Method
- Matrix Transfer
- Processing
- Waste Disposal
- Reclamation
- Water Sources
- Plant Siting
- Water Discharge
- Product Transport

Mobil's South Fort Meade mining operation has been designed to produce approximately 3.4 million tons of phosphate rock annually. The mine would be developed in two phases with Phase I scheduled to start up in 1984 following a 21-month construction period. Phase I operations, with an estimated capacity of 1.7 million tons per year, would include one dragline and an associated beneficiation plant. The start up of Phase II is planned for 1987 following a similar 21-month construction interval. Facilities comparable to Phase I would be developed in Phase II, increasing production capacity to 3.4 million tons per year.

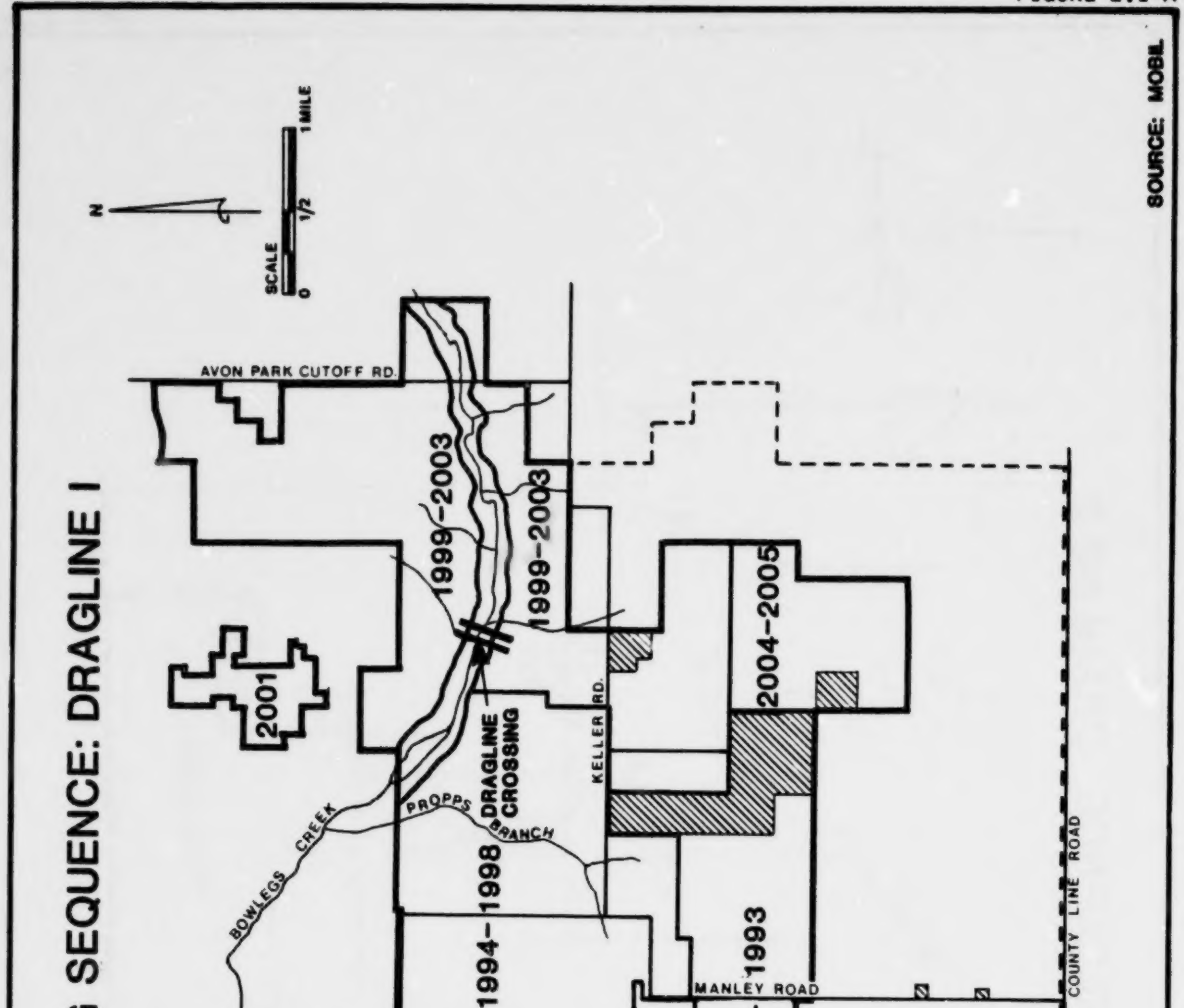
Equipment and procedures similar to those presently used in Mobil's two Florida phosphate mines as well as in other central Florida phosphate mines are proposed for the new facility. When in full production, two electrically powered walking draglines (45-cubic yard capacity each) would operate simultaneously, mining and extracting phosphate from separate areas. Mining operations would be scheduled on an around-the-clock basis, seven days a week, dependent upon production levels and sales requirements. The mining sequence, illustrated in Figures 2.1-A and B, is proposed to continue for 25 years with reclamation activities extending 10 years beyond the life of the mine. Each dragline would follow a sequence which balances production and grade requirements and facilitates water recirculation, waste disposal and reclamation activities. If production and sales requirements change, the length of the mine operation may also be changed.

The proposed mine operation would disturb approximately 15,194 acres or 93 percent of the site. Approximately 13,340 acres or 88 percent of the disturbed acreage is scheduled for actual mining. Another 1,854 unmined acres would be disturbed by various activities associated with mining and processing. Of that total, 1,320 acres would be required for initial waste disposal, 124 acres would be occupied by ore processing and support facilities, and 410 acres of unmined setbacks from property boundaries and public rights-of-way would be disturbed by adjacent mining and waste disposal activities. Existing land use patterns would continue on reserve lands until those lands are scheduled for mining. Approximately 1,094 acres would remain undisturbed.

Figure 2.1-C identifies the three areas preserved from mining. The preserved areas include the area below the 25-year flood elevation along the Peace River, a corridor along Bowlegs Creek approximately 660 feet in width, and a unit centrally located on the eastern boundary of the property. These areas occupy about 1,094 acres, or approximately 6.7 percent of the total surface area.

To gain access to mining parcels north of Bowlegs Creek, a dragline crossing would be located at an existing ford. Bowlegs Creek is scheduled to be crossed in 1999 and at the same location again in 2002. Woody vegetation in the corridor to the crossing would be cleared to about twice the width of the dragline and a culvert would be placed in the creek with earth backfilled around it. After each crossing, grass cover would be established to prevent

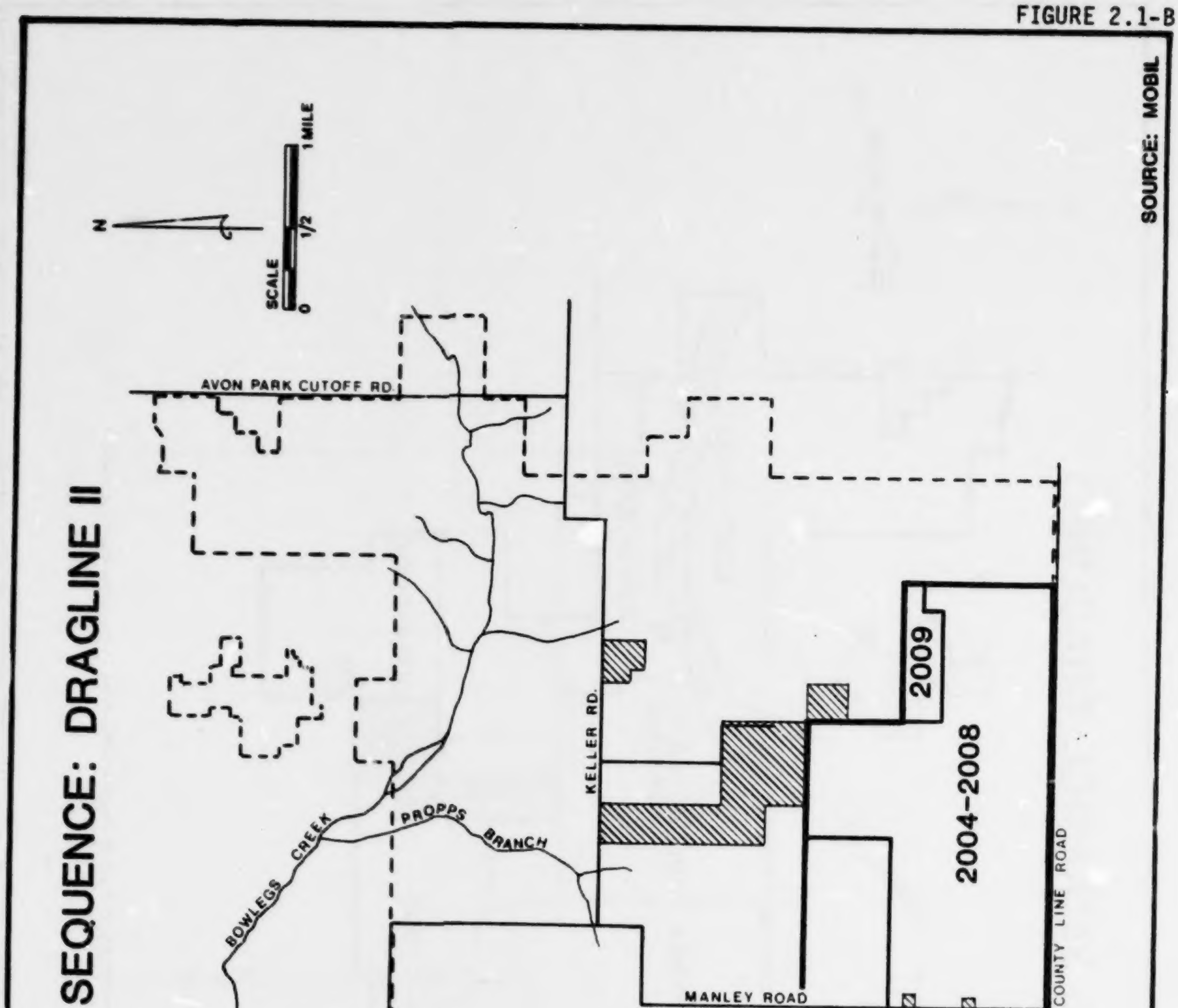
FIGURE 2.1-A


2001
1999–2003
1999–2003
2004–2005
DRAGLINE CROSSING
AVON PARK CUTOFF RD.
KELLER RD.
PROPPS BRANCH
BOWLEGS CREEK
1994–1998
1989–1993
1984–1988
MANLEY ROAD
KELLER RD.
MT. DESHEON RD.
PISGAH RD.
BRANCH
GURR RUN
GILSHEY BRANCH
STEPHENS
PEACE RIVER
U.S. 17
COUNTY LINE ROAD
▨ OUTPARCELS (PRIVATELY OWNED)
SCALE
0
1/2
1 MILE
N

MINING SEQUENCE: DRAGLINE I

SOURCE: MOBIL

FIGURE 2.1-B



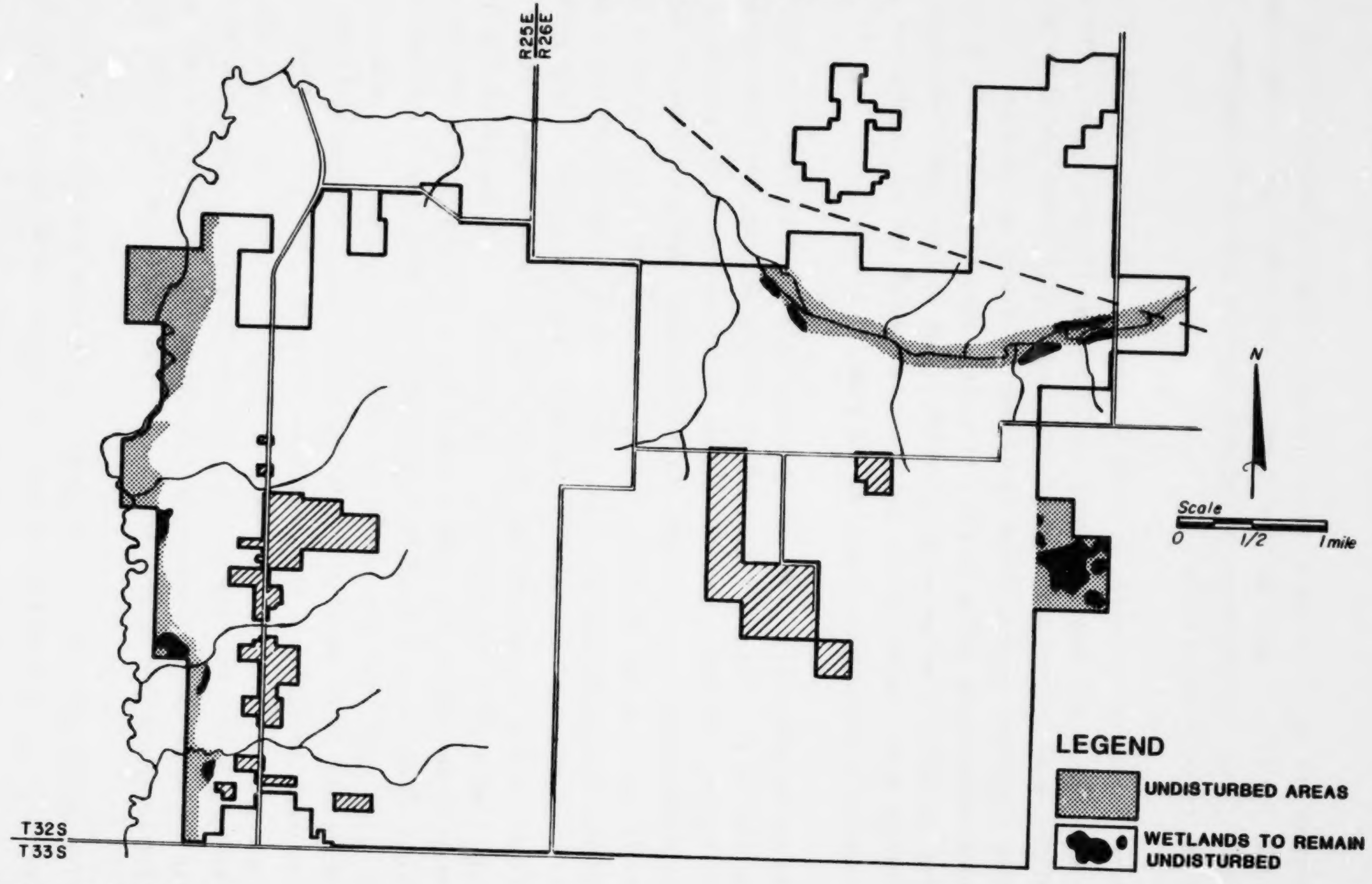
MINING SEQUENCE: DRAGLINE II

SCALE
0
1/2
1 MILE
N
AVON PARK CUTOFF RD.
KELLER RD.
KELLER RD.
BOWLEGS CREEK
PROPPS BRANCH
MANLEY ROAD
COUNTY LINE ROAD
MT. DESHEON RD.
PISGAH RD.
BRANCH
GURR RUN
GILSHEY BRANCH
STEPHENS
PEACE RIVER
U.S. 17
1987-1988
1989-1993
1994-1998
1999-2003
2004
2004-2008
2009
▨ OUTPARCELS (PRIVATELY OWNED)

SOURCE: MOBIL

FIGURE 2.1-C

UNDISTURBED AREAS


R25E
R26E
N
Scale
0
1/2
1 mile
T32S
T33S
LEGEND
UNDISTURBED AREAS
WETLANDS TO REMAIN UNDISTURBED

SOURCE: ZELLARS-WILLIAMS

erosion and runoff in the cleared corridor. After the second crossing in 2002, the culvert would be removed and the stream would be re-established. Tree species characteristic of wetlands would be planted to supplement the grass cover in the corridor.

After the matrix is mined, it would be slurried with water (18,750 gallons per minute [gpm]) and pumped via pipeline to the beneficiation plant. The matrix slurry would average about 35 percent solids. Each mining operation would have a separate pumping system to deliver the slurry to the plant. The pipeline routes would change as the mining areas move during the life of the mine, and the matrix pipeline would be routed across Bowlegs Creek from years 1999 through 2003. Double-walled pipe would be used at the matrix pipeline stream crossing to contain the slurry in the event of a leak.

At the beneficiation plant, the phosphate rock would be separated from the matrix slurry. The process operations include washing, feed preparation and flotation. The matrix slurry received at the beneficiation plant would contain phosphate, clay and sand. The washer would separate the matrix by particle size into two components: large phosphate pebble and a mixture of smaller sand, phosphate and clay. The pebble would then be routed to wet rock storage piles, and the undersized material would be routed to feed preparation. In the feed preparation process, clay would be removed from the undersized material by hydro-cyclones. The waste clay would be pumped from the feed preparation area to the waste disposal area. The remaining undersized material or flotation feed would be further separated according to particle size by a hydro-sizer into fine, coarse and sizer rock material. The three materials would then be routed to the flotation process where reagents would be added to separate the sand from the concentrate products. The reagents used in this process include No. 5 fuel oil, caustic, fatty acid, amine, kerosene, and sulfuric acid. The sand tailings from the flotation process would be pumped to the waste disposal area. The concentrate product from the flotation process would then be dewatered and retained in storage bins until shipment.

The beneficiation plant would produce waste clays and sand tailings. These residual clay and sand wastes would be redeposited on the South Fort Meade property in clay impoundment areas and sand tailings backfill areas (Figure 2.1-D). The estimated waste quantities would be approximately 132 million tons of clay and 158 million tons of sand tailings. For each ton of phosphate product produced at the proposed South Fort Meade Mine, 1.71 tons (dry weight) of clay and 2.05 tons (dry weight) of sand would be produced.

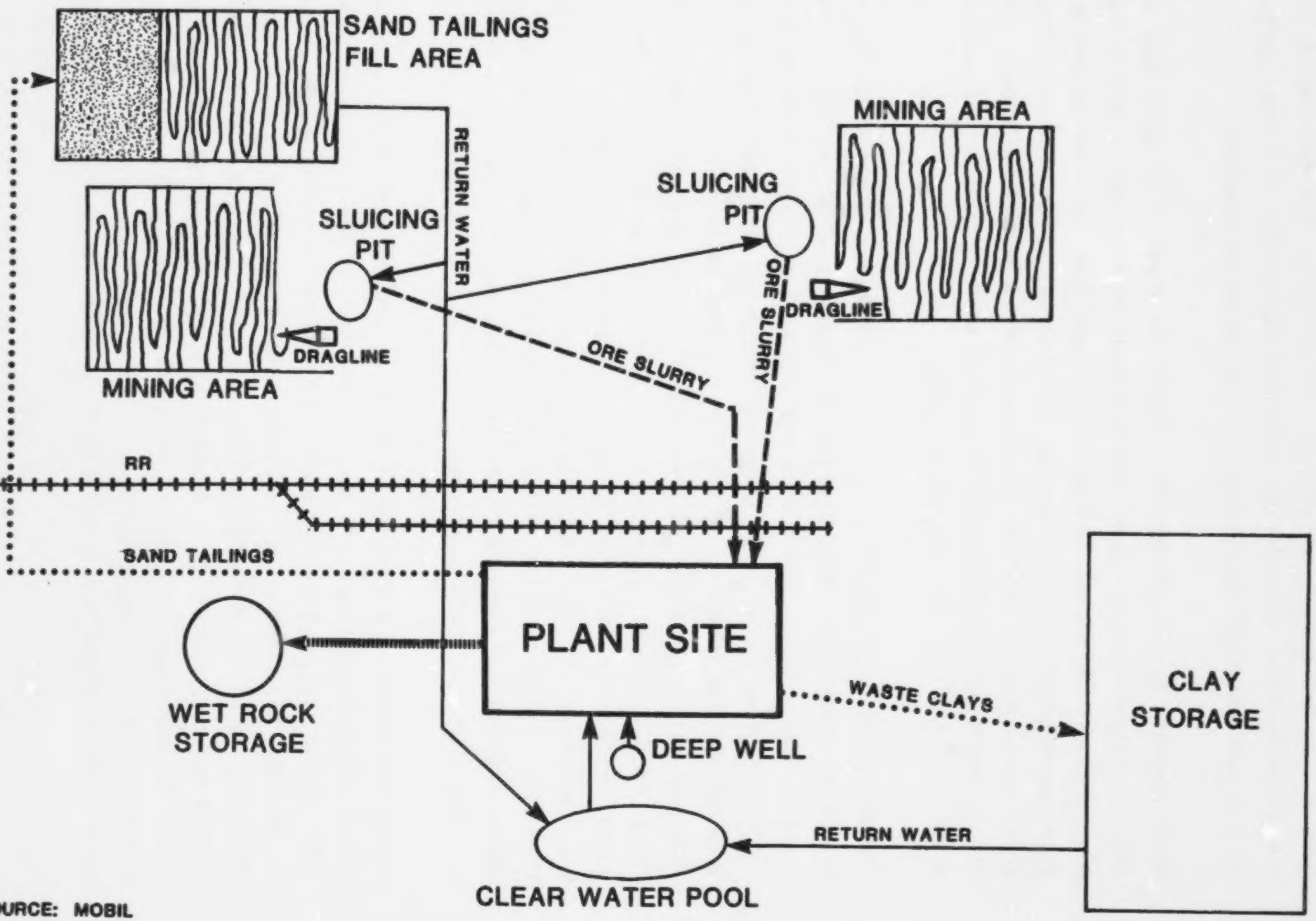
Mobil proposes to use conventional methods for disposal of waste sand tailings and clay (Figure 2.1-D). Sand tailings would be principally used to backfill mined areas (5,034 acres), and waste clays would be contained behind earthen dikes constructed on natural ground (1,320 acres) or constructed in mined areas (8,363 acres). Average dike heights would be 38.7 feet above grade. The estimated power consumption for pumping waste sand and clays would be $1,004 \times 10^6$ kWh over the life of the mine.

The design and construction of all impoundment dikes at the South Fort Meade Mine would comply with the provisions of Chapter 17-9 of the Florida Administrative Code. The dikes would be designed by a professional engineer registered in Florida and would be inspected regularly. The vegetation and soil cover on the face of each dike would be examined daily. The elevation of the impounded water, the amount of freeboard remaining, the condition of the drainage ditches, spillways and water control structures would also be inspected daily. Piezometers installed to monitor water levels and seepage patterns would be checked monthly. A qualified engineer would make an annual inspection of all retention dikes on the site, including an analysis of the piezometric readings and a review of all inspection reports to evaluate the effectiveness of the maintenance program.

During the course of mining, Mobil would disturb and reclaim approximately 15,194 acres of the South Fort Meade Mine site. Of the 2,055 acres of wetlands on the site, 1,923 acres would be disturbed by mining. When reclamation is complete, the total wetland acreage would be approximately 93 percent of that existing on the site; the combined forested stream channel and wetland acreage would exceed the existing wetland acreage by approximately seven percent. The reclaimed site is also scheduled to have approximately 1,940 acres planted as upland hardwood and mixed forest. Reclaimed upland mixed forest would serve to expand the forested zone along the Peace River and Bowlegs

FIGURE 2.1-D

CONCEPTUAL DIAGRAM OF MINING & WASTE DISPOSAL


SAND TAILINGS FILL AREA
RETURN WATER
MINING AREA
SLUICING PIT
SLUICING PIT
DRAGLINE
DRAGLINE
MINING AREA
ORE SLURRY
ORE SLURRY
RR
SAND TAILINGS
PLANT SITE
WET ROCK STORAGE
WASTE CLAYS
CLAY STORAGE
DEEP WELL
RETURN WATER
CLEAR WATER POOL

SOURCE: MOBIL

Creek and provide densely forested stands. The acreage distribution of the various land use categories is shown for both reclaimed and disturbed land in Table 2.1-1. Figure 2.1-E shows the reclaimed areas on the site.

The three sources of water for the mining operation would be ore water, rainfall and groundwater. Ore water would generally be unavailable for process purposes since it would be contained in matrix clays. Rainfall varies seasonally and is approximately equivalent to evaporation; it is, therefore, not a consistent source of supply. The most reliable water supply would be the deep aquifer system tapped by wells which would provide high quality process water on a continuous basis. Mobil proposes to withdraw 15.7 mgd for flotation process and makeup water from the Lower Floridan Aquifer utilizing three wells to a depth of approximately 1,000 feet. Groundwater would also be withdrawn for pump seal water and potable water from the Upper Floridan Aquifer at a rate of 0.713 mgd using wells approximately 240 feet deep. The withdrawal points for the Upper Floridan Aquifer water source would change during the life of the mine. The proposed withdrawal of 16.413 mgd of groundwater was approved by the Southwest Florida Water Management District (SWFWMD), and Consumptive Use Permit (CUP) No. 205403 was issued to Mobil on October 7, 1980.

Water management techniques at the South Fort Meade Mine would permit water to be recovered from ore transportation, washing, feed preparation, flotation processes and waste disposal, thus minimizing effluent discharges and consumptive uses. Estimated flow requirements for each water use are shown in Table 2.1-2, and a summary of the water balance is presented in Table 2.1-3.

The processing plant would be located on the west side of Manley Road, approximately two miles north of County Line Road (Figure 1.0-B and 2.1-F). The plant would be located in an area that is now primarily pasture. This location is the matrix centroid of pumping distances on the site and would be the most energy efficient location. The plant site would be adjacent to an existing road providing easy access for employees and deliveries. During construction and operation of the beneficiation plant, fugitive emissions from vehicular traffic would be minimized by paving the plant roads.

The primary water discharge from the mining area would occur from the 45-acre clear water pool adjacent to the processing facility. The clear water

TABLE 2.1-1

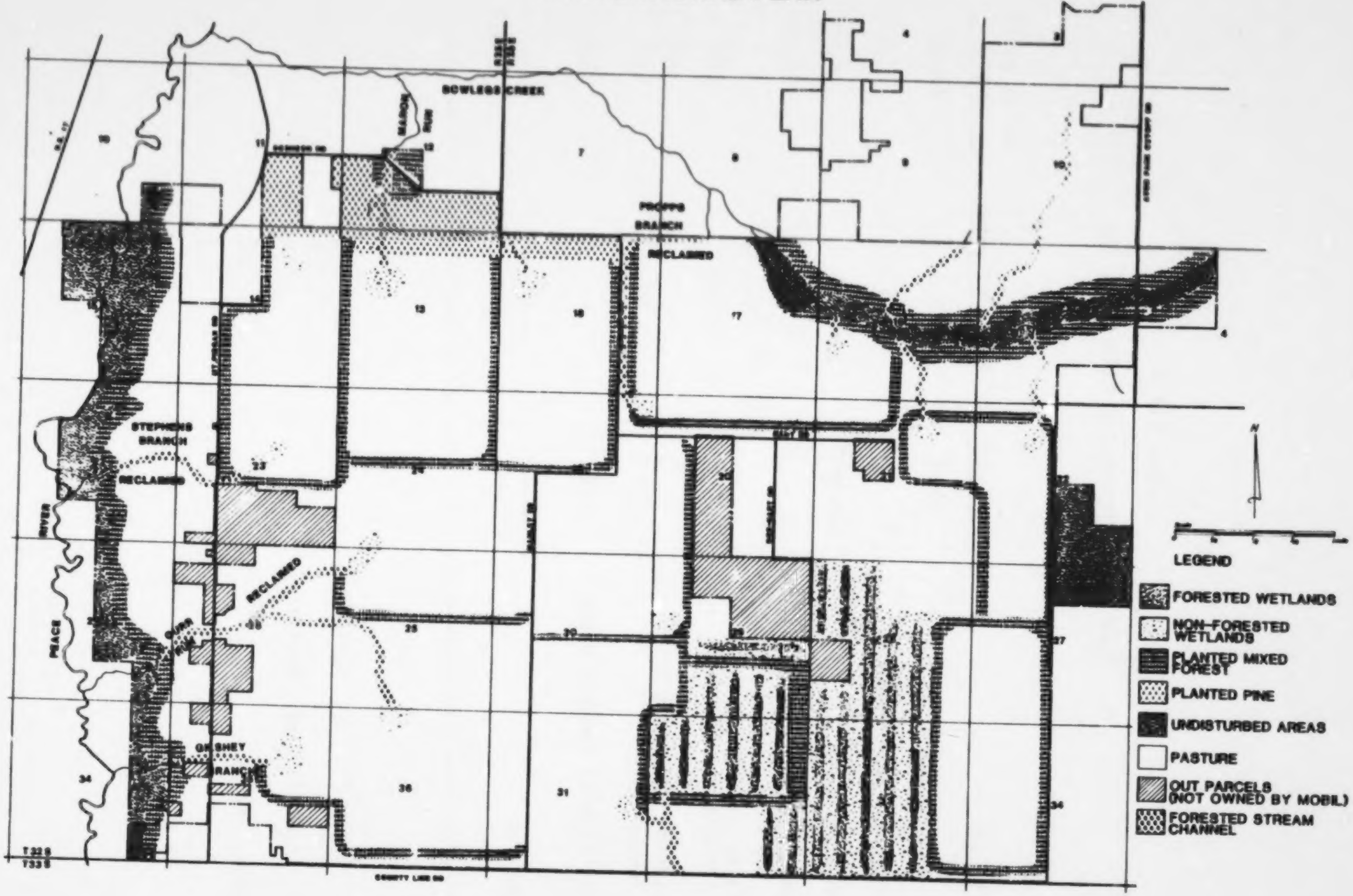
LAND USE CATEGORIES

(Conventional Plan)

Land Use Category	Reclaimed Acreage	Undisturbed Acreage	Post Mining Acreage
Improved Pasture	11,413	108	11,521
Cutover Flatwoods	0	182	182
Upland Hardwood Forest	0	664	664
Upland Mixed Forest	1,271	5	1,276
Planted Pine	453	0	453
Water Areas	0	3	3
Forested Stream Channels	277	0	277
Freshwater Swamp	478	111	589
Freshwater Marsh	1,302	21	1,323
TOTAL	15,194	1,094	16,288

SOURCE: MOBIL

POST RECLAMATION LAND USE
CONVENTIONAL PLAN



BOWLEGS CREEK
MARION RUN
PROPPS BRANCH
RECLAIMED
STEPHENS BRANCH
RECLAIMED
RECLAIMED
BRANCH
PEACE RIVER
T32S
T33S
COUNTY LINE RD
LEGEND
▨ FORESTED WETLANDS
▨ NON-FORESTED WETLANDS
▨ PLANTED MIXED FOREST
▨ PLANTED PINE
■ UNDISTURBED AREAS
☐ PASTURE
▨ OUT PARCELS (NOT OWNED BY MOBIL)
▨ FORESTED STREAM CHANNEL
N

SOURCE: MOBIL

FIGURE 2.1-E

TABLE 2.1-2

FLOW REQUIREMENTS FOR EACH WATER USE

Water Use	New Water	Recycled Water	Total Water Usage
	(mgd)	(mgd)	(mgd)
Slurry Transport Water	0	27.0	27.0
Pump Seal Water	0.691(1)	0	0.691
Washing/Dilution Water	0	52.0	52.0
Rinsing and Feed Preparation Water	0	38.0	38.0
Flotation Process and Makeup Water	15.7(2)	40.2	55.9
Miscellaneous Potable Water	0.022(1)	-	0.022
TOTAL	16.413	157.2	173.613

(1) Upper Floridan Aquifer

(2) Lower Floridan Aquifer

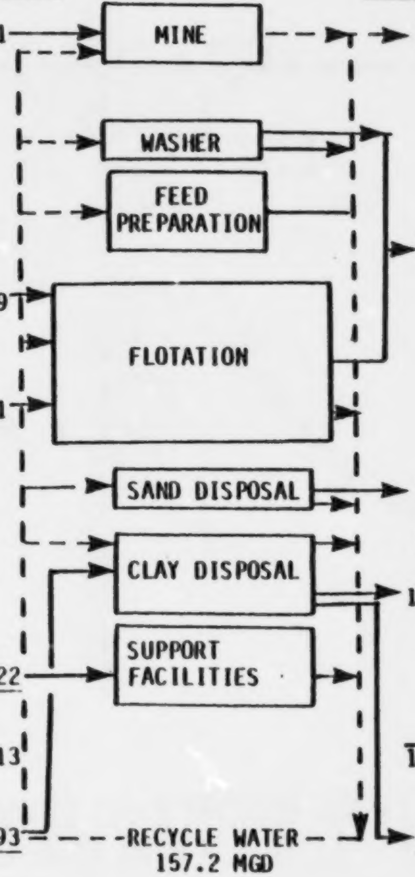
SOURCE: MOBIL

TABLE 2.1-3

MINE WATER BALANCE

WATER SOURCES

FUNCTION/SOURCE	VOLUME, MGD
SEAL WATER (UPPER FLORIDAN AQUIFER)	0.691
MAKEUP WATER (LOWER FLORIDAN AQUIFER)	3.389
AMINE FLOTATION PROCESS WATER (LOWER FLORIDAN AQUIFER)	12.311
POTABLE WATER (UPPER FLORIDAN AQUIFER)	0.022
TOTAL FROM GROUNDWATER SUPPLY	16.413
ORE WATER (NON-SUPPLY)	2.593
TOTAL	19.006


MINE
WASHER
FEED PREPARATION
FLOTATION
SAND DISPOSAL
CLAY DISPOSAL
SUPPORT FACILITIES
RECYCLE WATER
157.2 MGD

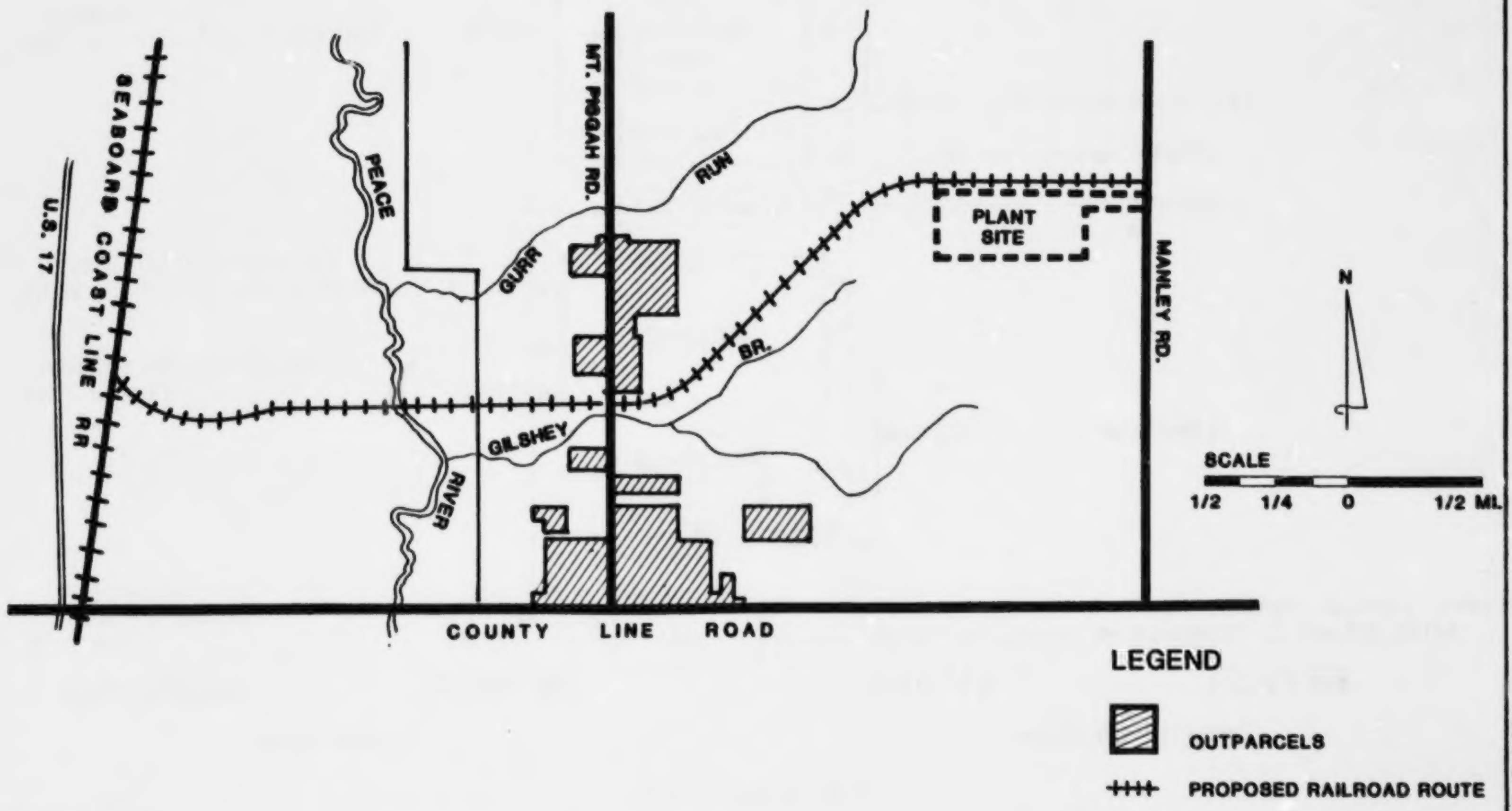
WATER DISPOSITION

VOLUME, MGD	DISPOSITION
0	DISCHARGE TO SURFACE WATER (ONLY IN HEAVY RAINFALL PERIOD)
0.333	PRODUCT
1.725	TAILINGS
2.713	SEEPAGE
11.642	WASTE CLAY
16.413	TOTAL DISPOSITION FROM SUPPLY
2.593	WASTE CLAY ORE WATER (NON-SUPPLY)
19.006	TOTAL

SOURCE: MOBIL

FIGURE 2.1-F

PROPOSED PLANT SITE LOCATION AND RAILROAD ROUTE


SEABOARD COAST LINE RR
U.S. 17
PEACE RIVER
MT. PISGAH RD.
GURR RUN
BR.
GILSHEY
PLANT SITE
MANLEY RD.
COUNTY LINE ROAD
N
SCALE
1/2
1/4
0
1/2 MI.
LEGEND
OUTPARCELS
PROPOSED RAILROAD ROUTE

SOURCE: MOBIL

discharge would flow into the Peace River by way of a vegetated drainage swale (outfall ditch) constructed parallel to the railroad route. There would be additional outfalls associated with the spillways of individual settling basins, but these would only discharge in extreme circumstances when excessive rainfall threatens to overtop the basins. These settling basin discharges could intermittently occur for the period between the construction of the settling basin and the reclamation of the basin. Over the active mining period, the location of the emergency discharge outfalls would shift as basins are reclaimed. The discharged water would be directed to Bowlegs Creek and Stephens Branch. Special precautionary measures would be implemented in the event of hurricane warnings in the area including draining storage basins of excess water to prevent overtopping the dikes.

Mobil proposes to construct a six-mile railroad spur from the beneficiation plant to the Seaboard Coast Line track west of the site in order to transport the phosphate product. A bridge would be built to cross the Peace River and a grade crossing would be required on Mt. Pisgah Road. The proposed railroad route is depicted in Figure 2.1-F.

Mobil's proposed action also includes a number of measures designed to reduce the potential for adverse impacts on the environment. These are described below by the components with which they are most closely associated.

Mining

- The existing vegetative cover would be maintained on all land for which mining or support activities are not imminent.
- The vegetative cover on about seven percent of the mine site would be preserved, including the most important wetland acreages.
- The dragline crossing of Bowlegs Creek would be at an existing ford, disturbing the least total area, particularly the least wetland area.
- The dragline crossing through the preserved portion of Bowlegs Creek would be along a single corridor.
- Vegetation would be established on the approach to the creek crossing and would be maintained until the final crossing is made.
- Fill introduced into creek channels during dragline crossings would be removed after the crossing and the banks immediately stabilized with vegetation.

- Perimeter rim ditches would be used, where necessary, to maintain Surficial Aquifer levels at adjacent property boundaries and within the preserved areas.
- Pocket toe spoiling, a technique in which overburden from near the interface with the matrix is placed in a pocket at the toe of the spoil pile and covered with overburden from the upper strata would be implemented as a leach zone management practice.

Matrix Transport

- The matrix pipeline crossing of Bowlegs Creek would be in the same corridor as the dragline crossing, therefore disturbing the least total area, particularly the least wetland area.
- Double-walled pipe would be used at the matrix pipeline stream crossing to contain the slurry in the event of a leak.
- The slurry pipeline would be inspected several times each day to identify any leakage.

Matrix Processing

- Roads in the plant area would be paved before construction to reduce dust.
- During plant construction and operation, perimeter ditches would be used to contain runoff from the plant site area.
- Storage facilities for reagents, fuel, lubricants, etc. would be above ground within a walled or diked area designed to contain spillage.
- Safety and spill control training programs would be implemented for operations and maintenance personnel.

Water Management System

- Groundwater withdrawal may be reduced in dry periods to comply with Southwest Florida Water Management District (SWFWMD) regulations.
- Water would be recycled in the mining, processing and waste disposal operations to the maximum extent possible.

Waste Sand and Clay Disposal

- The design and construction of dikes required for the impoundment of clay and sand/clay wastes would comply with all provisions of Chapter 17-9 of the Florida Administrative Code.

- Dike faces would be planted in grasses to inhibit wind and water erosion and would be mowed as necessary for visual inspection.
- All dikes would be inspected daily by a trained Mobil employee and annually by a registered engineer.

Reclamation

- All dikes and ditches would be recontoured as required by the Florida Department of Natural Resources.
- All disturbed land would be revegetated.
- When reclamation is complete, the total wetland acreage (1,923 acres) would be approximately 93 percent of that now existing on the site; the combined forested stream channel and wetland acreage would total 2,200 acres, exceeding the existing wetland acreage by approximately seven percent.
- Planted pine would be harvested prior to mining and the site would be reclaimed with 34 percent more area of planted pine cover (453 acres).
- Reclaimed upland mixed forest would expand the forested zone along the Peace River and Bowlegs Creek.
- Stream channels would be reclaimed near present stream locations, and banks of the stream channels would be revegetated to reduce erosion.
- The beneficiation plant site would be cleared and revegetated after mining has been completed.
- Reclamation would be conducted as soon as areas become available.

Plant Construction and Operation

- Construction labor would be drawn from the local labor force to the maximum extent possible.
- The new mining operation would be staffed primarily with employees transferred from Mobil's existing work force in the area.

As stated earlier in this section, Mobil's proposed action is comprised of a number of project subsystems linked so as to provide a total project capable of meeting Mobil's production objectives. However, the methods proposed by Mobil to achieve these objectives are not the only ones available. In the following sections, various mining subsystem alternatives associated with the previously identified mining subsystems are described and evaluated, and the environmentally preferred alternatives are identified. Under a given subsystem heading (e.g., mining method, matrix transfer, etc.) a general description of each alternative is presented, followed by environmental considerations pertaining to it. Where additional information is required to complete the evaluation, technical and economic considerations are provided. The first alternative discussed under each subsystem heading is Mobil's proposed action, followed by other reasonable alternatives. Lastly, a summary comparison is presented to identify the environmentally preferred alternative.

2.2 MINING METHOD ALTERNATIVES

The three potential mining methods that could be used at the proposed South Fort Meade Mine site are dragline, bucket wheel and dredge mining. Any of the three methods would disturb 15,194 acres of the 16,288-acre site, and would include land clearing and open burning, drainage basin alterations, and disruption of surface soils and the upper geologic strata. Associated with the mining methods would be emissions of dust and fuel combustion, increased surface runoff and erosion, disruption of stream flows and the Surficial Aquifer, and the loss of vegetation, some wildlife, and most wildlife habitat in the mine area. These common impacts cannot be avoided with any of the surface mining methods. There are, however, specific advantages and disadvantages for the three alternatives as presented in the following discussion.

2.2.1 DRAGLINE MINING (MOBIL'S PROPOSED ACTION)

2.2.1.1 General Description

Mobil proposes to use dragline mining as conventionally practiced in the Florida phosphate industry. Two large electric-powered walking draglines, with bucket capacities of 45-cubic yards each, would be used to sustain an average annual production rate of 3.4 million tons. At this production rate, approximately 530 acres per year would be mined. A 50-acre parcel would be cleared ahead of each dragline. The walking dragline is a mobile unit that removes the matrix efficiently and maneuvers well. Annual energy requirements for the dragline are estimated at 1,650 kW for Phase I (one dragline) and 3,300 kW for Phase II (two draglines).

Mobil proposes to use pocket toe-spoiling as a leach zone management technique. The draglines would selectively strip and place the final bucket of overburden (the last six feet) in a pocket at the bottom of the mining cut, subsequently covering the material with overburden spoils. This technique confines the distribution of potential leach zone material to a level below its in-situ location.

Operating constraints require a relatively dry pit for safety and optimum matrix recovery. To attain the required dry condition, dewatering of the Surficial Aquifer would be necessary, temporarily lowering water table levels adjacent to the pit. To minimize the drawdown influence, Mobil proposes to utilize perimeter rim ditches for recharge at property boundaries and at designated sensitive areas.

To gain access to mining parcels north of Bowlegs Creek, a dragline crossing would be located at an existing ford (Figure 2.1-A). The stream is scheduled to be crossed in 1999 and again in 2002, with both crossings timed to occur during low flow conditions. Woody vegetation in the corridor to the Bowlegs Creek crossing would be cleared to about twice the width of the dragline. A culvert would be placed in the stream with earth backfilled around the culvert. After each crossing, grass cover would be established in the cleared corridor to prevent erosion and runoff. After the second crossing in 2002, the culvert would be removed and the stream channel re-established. Planting of tree species characteristic of wetlands would supplement the grass cover in the corridor area.

2.2.1.2 Environmental Considerations

Environmental Advantages: Leach zone management can be conducted with the dragline mining method, thereby reducing the radiation levels in the soils of the reclaimed areas. Draglines are efficient users of energy (8.5 kWh/ton product) and an efficient recovery of phosphate matrix (85 to 87 percent) can be realized. The mobility of the dragline allows mining around odd-shaped boundaries and preserved areas.

Environmental Disadvantages: The required dewatering of the mine pits would lower the water table level in the Surficial Aquifer (drawdown of one foot is expected 115 feet from the perimeter of the open pit) and reduce natural recharge by about 0.1 inch per year over the total project site. Dragline mining would also create a very uneven spoiling pattern, sometimes called windrows. The creation of such windrows would require that heavy equipment be utilized in reclamation to create a more uniform topography. Such leveling would require the burning of fuel (in heavy equipment), resulting in increased air pollutant levels (i.e., from combustion products).

2.2.2 BUCKET WHEEL EXCAVATION

2.2.2.1 General Description

A bucket wheel excavator is a large rotating wheel with fixed buckets attached on its periphery. The bucket wheel excavator digs and cuts, discharging the material onto an associated conveyor belt system. The main features of bucket wheel excavators are continuous excavation of material and uninterrupted discharge onto a conveyor system. They are generally equipped with crawlers to provide mobility, allowing continuous use on various working levels.

Mining Mobil's South Fort Meade phosphate deposit would require a total of four bucket wheel excavators. The excavators would be paired together and would mine at two separate locations, in much the same sequence as the dragline operation. One excavator would strip overburden while the other would mine the matrix. Compared with draglines of equal output, the bucket wheel excavator is physically smaller because it is a continuous excavator. A bucket wheel excavator equivalent to a 45-cubic yard dragline would be equipped with 0.9 to 1.5-cubic yard buckets, depending on the number of buckets, wheel diameter, cutting speed and other parameters.

Bucket wheel excavators are efficient energy users due to uniform power loading and lower instantaneous power demands. As more difficult to excavate material is moved, however, the efficiency decreases. Leach zone management can be accomplished with bucket wheel excavators. The bucket wheel mining method would require a larger cleared area ahead of the mining operation than the dragline method. Totally dry pit conditions are necessary to prevent high wall failure and to obtain structural stability. During the rainy season, the increased moisture content in the matrix and water in the pit may be difficult to control.

2.2.2.2 Environmental Considerations

Environmental Advantages: Bucket wheel excavators are lower energy users than draglines of equivalent size due to uniform power loading and lower instantaneous power demands. However, the energy efficiency advantage is partially off-set because four bucket wheel units are required to accomplish the same mining rate as two dragline units. The equipment can be operated to achieve leach zone management similar to that with the dragline, thereby reducing surface radiation levels in reclaimed areas.

Environmental Disadvantages: Bucket wheel mining would require a larger cleared area than the dragline method, with correspondingly greater fugitive dust emissions. Mining with a bucket wheel would require additional handling of the overburden through conveyors which could potentially increase fugitive dust and would generate greater noise levels than the dragline mining method. Greater dewatering of the Surficial Aquifer would be required around the mine pit to maintain a totally dry pit condition.

2.2.2.3 Technical Considerations

The bucket wheel mining method requires a totally dry pit because the equipment is located in the pit. If dry pit conditions are not maintained, high wall failures could occur in the pit, creating a safety risk and the potential loss of equipment. The matrix must be dry to support the bucket wheel unit. During the rainy season, additional dewatering of the matrix and the pit would be necessary to operate the bucket wheels. The matrix contains clay which often has sticky characteristics. The bucket wheel mechanism may not be able to handle this material very effectively. If the buckets do not empty, the mining rate would be reduced and energy consumption would increase.

2.2.3 DREDGE MINING

2.2.3.1 General Description

The basic dredge design consists of equipment mounted on a barge for floating on water and moving over the material to be excavated. The excavating part of the dredge is generally supported on a boom at the forward end. Several spuds, or retractable anchor posts, are located on the aft end of the dredge to hold it in a stable position.

The cutterhead pipeline dredge is thought to be the most appropriate dredge for application in a Florida phosphate mining operation due to the consistency of the overburden. The unit is equipped with a rotating cutterhead surrounding the intake end of the suction pipe. At least two large capacity electric dredges would be required for the South Fort Meade Mine: one to strip the overburden and one to mine the matrix. The overburden dredge would excavate and pump overburden material to designated settling areas for dewatering, and water decanted from the overburden slurry would flow back to the dredge pond to be recirculated. The matrix dredge would excavate and pump the phosphate matrix in a slurry form (similar to the dragline operation) to the beneficiation plant. The dredge mining method requires about twice as much energy per ton of phosphate product as the dragline mining method.

2.2.3.2 Environmental Considerations

Environmental Advantages: Fugitive dust emissions would be negligible with this method since excavation is done underwater and overburden and matrix are moved as slurry. Potential dust emissions would be further reduced by the flooding of the cleared acreage. Because of the flooding of the mine pit to support the dredge, there would also be no dewatering effects on the Surficial Aquifer during the removal of overburden.

Environmental Disadvantages: Leach zone management cannot be achieved with this method. This would result in greater surface radiation levels in reclaimed areas as compared to the other mining methods incorporating leach zone management.

Slurrying the overburden during dredging would result in the loss of water with the overburden clays, increasing the volume of required clay settling areas and makeup water requirements. The dredge method does not require the lowering of the water table during the mining of overburden; however, the water level must be lowered to approximately 25 feet below grade to mine the phosphate matrix. The dredge operation would increase the concentration of total suspended solids, organic material, and inorganic material in the dredge pool water. This water could degrade the quality of the water in the recirculation system, the water discharge and the Surficial Aquifer. The dredge would also use more energy than either the bucket wheel or dragline (about twice as much as the dragline).

2.2.4 SUMMARY COMPARISON

The dragline mining method is considered to be the environmentally preferred mining method. The capability to practice leach zone management and energy efficiency are overriding factors supporting this selection. The difficulty in additional dewatering and lack of stability of the matrix would be significant problems associated with the bucket wheel method. The dredge method would result in increased water consumption, energy usage and use of abovegrade storage basins. The dredge mining method becomes even less desirable because of the inability to perform leach zone management, resulting in higher surface radiation levels in reclaimed land areas.

2.3 MATRIX TRANSFER ALTERNATIVES

Once the matrix is mined, it must be transferred to the beneficiation plant. Due to the volume of material, all methods of transporting the matrix to the plant would require large amounts of energy. The proposed action for matrix transfer is a slurry pipeline. Alternative matrix transfer methods are a conveyor system and transfer by truck.

2.3.1 PIPELINE TRANSFER (MOBIL'S PROPOSED ACTION)

2.3.1.1 General Description

The mined ore would be dumped by the dragline into a sluicing pit for disaggregation. Recirculation water (18,750 gpm) would be directed by hydraulic guns to break up the material and slurry the matrix to a pumpable mixture. Grizzly screens (large bar screens) would be used to prevent oversized rocks and other material from entering the pit pump. Each mining operation would have a separate pumping system to deliver the slurry to the plant. A booster pump would be located within 1,500 feet of the pit pump with additional booster pumps spaced at one-half to three-quarter mile intervals, depending upon the difference in elevation, pumping distance and the head developed by each pump. An 18-inch slurry pipeline would transport the ore from each mining area to the beneficiation plant at a rate of approximately 1,200-cubic yards per hour per pipeline. The energy demand for the pipeline transfer system is estimated to be 4,800 kW for Phase I and 7,100 kW for Phase II. Power utilization for matrix pumping would be 17.8 kWh/ton of product.

Double-walled pipe would be used at the Bowlegs Creek stream crossing to minimize the potential of a spill. The pipeline crossing would be in the same vicinity as the dragline crossing (Figure 2.1-A) and would occur between years 1999 and 2003. Any leakage would be caught in the external pipe and collected at either side of the crossing; valves would be provided to shut off the flow in the event of a pipe failure. Mobil would conduct a routine inspection and maintenance program to prevent leakage and spills from the pipeline system.

2.3.1.2 Environmental Considerations

Environmental Advantages: No fugitive dust emissions would be associated with the pipeline transfer of wet slurry. Because the slurry pumps would be driven by electric motors, pumping would not result in any point source combustion emissions at the site. The noise generated by the pumps would not contribute to the off-site noise environment. The corridor required for the pipeline would be only approximately 12 feet wide and would usually be maintained on disturbed land.

Environmental Disadvantages: The possibility of a pipeline or pump failure exists which could pollute streams if spills went unchecked. The pipeline transfer method also requires 480 gpm of pump seal water, which would not be required by either conveyor or truck transport.

2.3.2 CONVEYOR SYSTEM

2.3.2.1 General Description

Conveyor systems have recently been considered by most phosphate mining companies as an alternative method for matrix transport. A conveyor belt is designed for continuous transportation of bulk material and is usually an economical system to operate for large quantities of solid material.

2.3.2.2 Environmental Considerations

Environmental Advantages: Conveyor transport of the damp matrix would reduce the potential for spillage impacts on surface water, although protective measures would be required at stream crossings. This transfer method would also eliminate the need for 480 gpm of pump seal water.

Environmental Disadvantages: The use of a conveyor transport system would cause minor increases in particulate levels from fugitive dust emissions. The corridor requirements for the conveyor would be larger than for the pipeline method, resulting in increased disturbance to wildlife and vegetation on unmined areas. The conveyor belt system would generate greater noise levels (70 dBA could occur at 175 feet) than the pipeline transfer system. Energy requirements for the conveyor belt and support equipment to move the matrix from the mine pit to the conveyer belt hopper would be comparable to the pipeline transfer method. Greater spillage of material would be expected due to the start-and-stop motion of the conveyor belt.

2.3.2.3 Technical Considerations

A conveyor belt system has distinct operation and maintenance problems when applied to on-stream phosphate ore production. Conveyor belt systems are designed to transport a dewatered and sized material; however, phosphate ore is unsized and variable in moisture content. Conveyor systems require a controlled feed rate to maintain a continuous, even flow of material on the belt to match design rates. The dragline operates simultaneously as a stripping and mining machine resulting in irregular flow cycles to the dump hopper. Therefore, it would be necessary to stack the mined ore along the surface of the mining cut. The ore would be rehandled by front-end loaders or a small bucket wheel excavator and transferred to a centrally located hopper position. The matrix would then be transferred on an apron feeder onto the conveyor belt to be transported to the beneficiation plant. At the plant the ore would be deposited in a sump, slurried with approximately 19,000 gpm of high pressure water and pumped to the top of the washer for processing. The conveyor system would not be as mobile as the pipeline system.

Two independent 36-inch conveyor systems would be required to transfer the ore from Mobil's two mining areas to the beneficiation plant. Energy requirements for the conveyor belt system would be 11.2 kWh/ton. The energy requirements for the additional equipment needed to move the matrix from the mining area to the conveyer belt hopper would be 0.4 gal fuel/ton product (equivalent to 6.3 kWh/ton product). Therefore, the combined energy requirements for the conveyor system and the support equipment would amount to approximately 17.5 kWh/ton product.

2.3.3 TRUCK TRANSFER

2.3.3.1 General Description

Matrix transfer by diesel engine truck could be accomplished during Phase I with 25-ton capacity trucks making 820 round trips per day. During Phase II, 1,640 truck trips per day would be necessary using trucks with a 25-ton capacity. Transferring matrix by truck would require the construction and maintenance of roadbeds from the mining area to the plant. The truck transfer method would require 1.2 gal fuel/ton product (equivalent to 19 kWh/ton product). At the plant, matrix would be dumped and/or washed out of the trucks and, as with conveyor transport, mixed with approximately 19,000 gpm of recycle water before further processing.

2.3.3.2 Environmental Considerations

Environmental Advantages: When sufficient freeboard is left during loading, the truck transfer method would have the least potential for spillage into surface waters. This transfer method would also eliminate the need for 480 gpm of pump seal water.

Environmental Disadvantages: Energy requirements for the truck transfer method would be greater than the pipeline or conveyor system transfer methods. The construction, maintenance and use of haul roads would cause the most disturbance to wildlife and vegetation. Truck transfer would generate the higher noise levels of the three transfer methods and the greatest amounts of air emissions such as fuel exhaust and fugitive dust.

2.3.4 SUMMARY COMPARISON

Energy consumption and air emissions are primary disadvantages to truck transport. Secondary handling requirements offset any energy savings of the conveyor as compared to the pipeline, and difficult technical problems may preclude its feasibility at the present time. Therefore, the environmentally preferred alternative is pipeline transfer of matrix.

2.4 MATRIX PROCESSING ALTERNATIVES

Processing is the application of beneficiation techniques to the matrix after it is mined and transported to the plant. At the plant, the phosphate is separated from the waste materials (sand tailings and clays) upgrading the phosphate. Mobil proposes to use conventional beneficiation techniques as they are currently practiced throughout central Florida. A processing alternative for the South Fort Meade Mine would be the use of dry separation.

2.4.1 CONVENTIONAL BENEFICIATION (MOBIL'S PROPOSED ACTION)

2.4.1.1 General Description

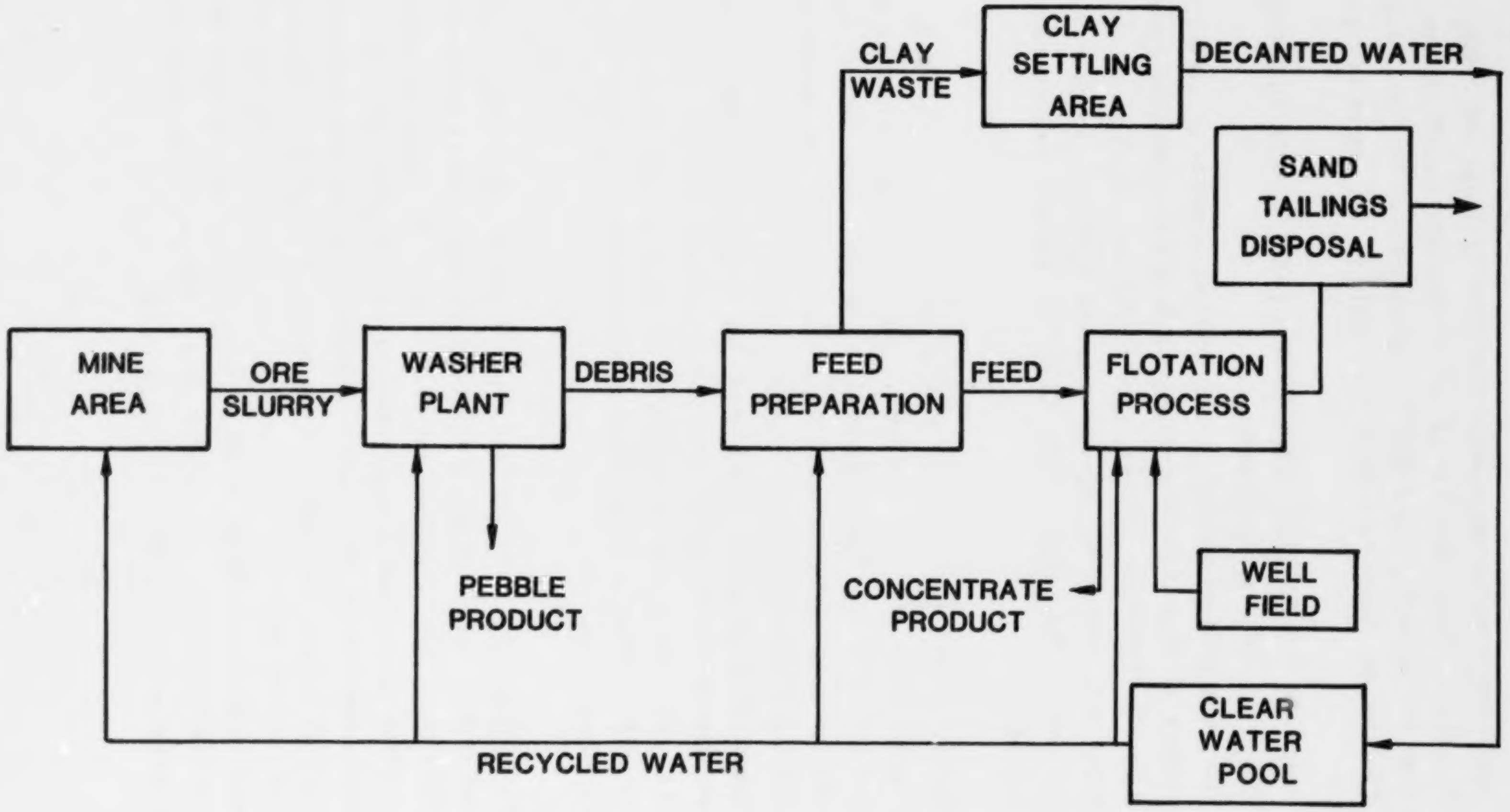
The processing of phosphatic ore involves a number of steps, each with the purpose of separating phosphate rock from the associated organics and gangue minerals (limestone cobbles, quartz sand and a mixture of clay minerals). The major unit processing operations at the South Fort Meade Mine would include the washer, feed preparation, flotation, and wet rock product storage (Figure 2.4-A).

Washing Facilities: The ore slurry received at the washer by pipeline would contain phosphate, clay and sand. The washer would separate the ore by particle size into two components: large phosphatic pebble, and a mixture of smaller sand, phosphate and clay (Figure 2.4-B). The washer process would involve a number of steps: separating the oversized material, pulverizing the oversized material, disaggregating the clays and phosphatic ore, and washing and separating the pebble from the undersized material (waste clays and feed). The pebble would then be routed to wet rock storage piles, and the undersized material (commonly termed debris) would be routed to feed preparation for further processing.

Feed Preparation: In the feed preparation process, undersized material from the washing operation would initially be separated by hydro-cyclones into two fractions: flotation feed and waste clay. The flotation feed would be directed to the feed preparation area or stockpiled until required for further processing. Waste clays would be pumped from the feed preparation area to disposal sites. The feed from the hydro-cyclones would be separated into fine, coarse and sizer rock feeds by hydro-sizers. The feed preparation area would provide a limited amount of storage capacity and would deliver feed to the flotation plant at a uniform rate. The conceptual plan for the feed preparation process is shown in Figure 2.4-C.

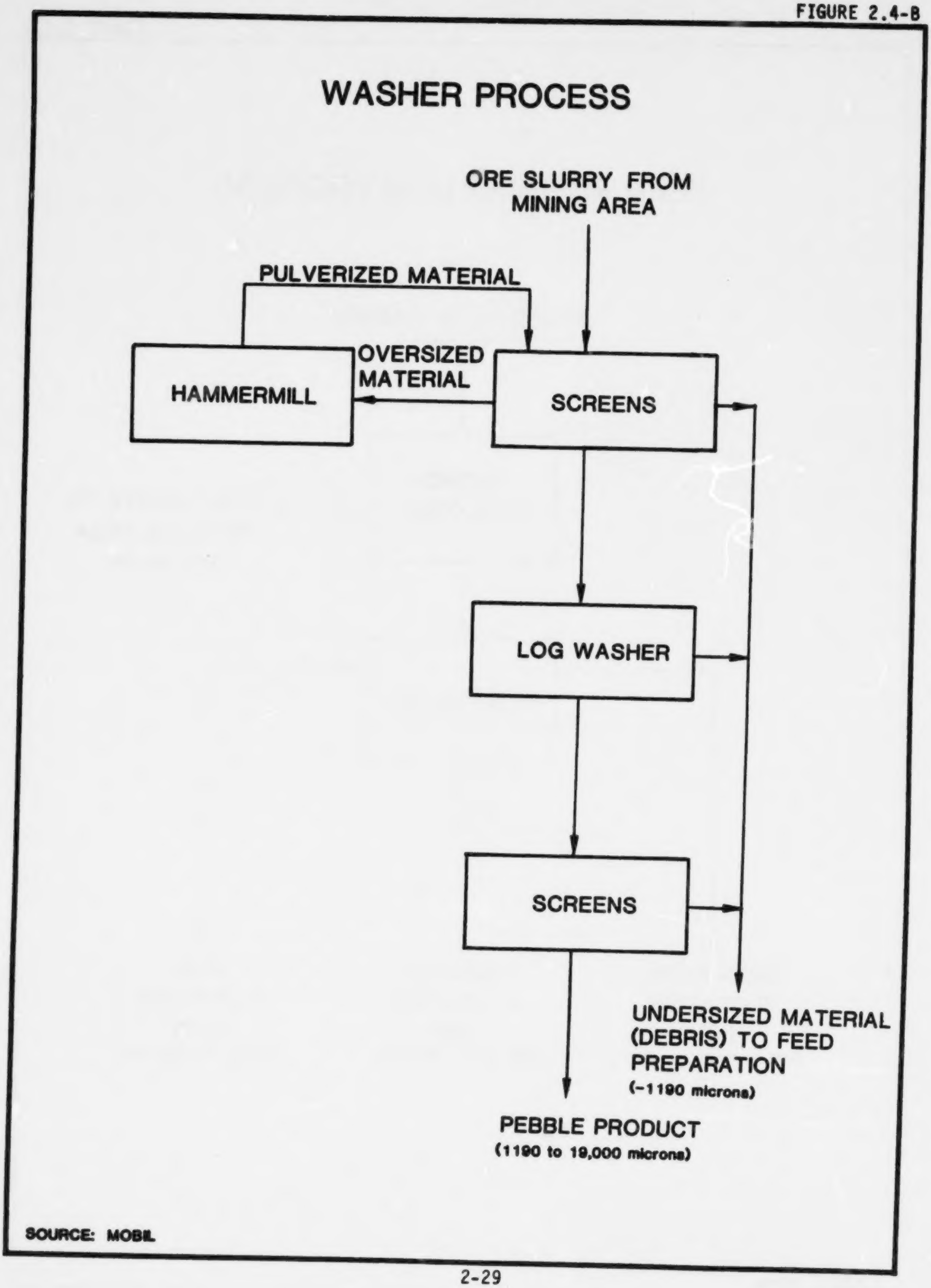
FIGURE 2.4-A

GENERALIZED PROCESS FLOW SHEET


CLAY
SETTLING
AREA
DECANTED WATER
CLAY
WASTE
SAND
TAILINGS
DISPOSAL
MINE
AREA
ORE
SLURRY
WASHER
PLANT
DEBRIS
FEED
PREPARATION
FEED
FLOTATION
PROCESS
PEBBLE
PRODUCT
CONCENTRATE
PRODUCT
WELL
FIELD
CLEAR
WATER
POOL
RECYCLED WATER

SOURCE: MOBIL

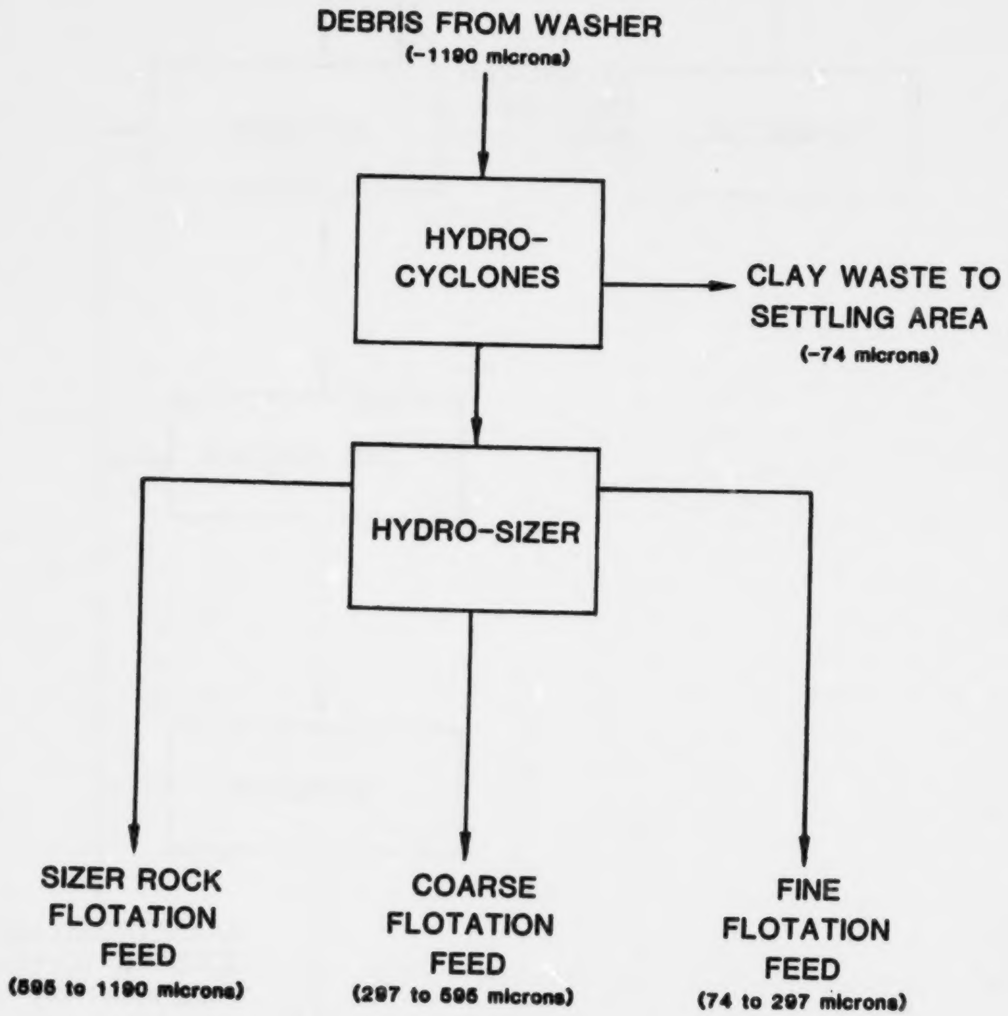
FIGURE 2.4-B


WASHER PROCESS
ORE SLURRY FROM MINING AREA
PULVERIZED MATERIAL
HAMMERMILL
OVERSIZED MATERIAL
SCREENS
LOG WASHER
SCREENS
UNDERSIZED MATERIAL (DEBRIS) TO FEED PREPARATION
(-1190 microns)
PEBBLE PRODUCT
(1190 to 19,000 microns)

SOURCE: MOBIL

FIGURE 2.4-C

FEED PREPARATION PROCESS


DEBRIS FROM WASHER
(-1190 microns)
HYDRO-CYCLONES
CLAY WASTE TO SETTLING AREA
(-74 microns)
HYDRO-SIZER
SIZER ROCK FLOTATION FEED
(595 to 1190 microns)
COARSE FLOTATION FEED
(297 to 595 microns)
FINE FLOTATION FEED
(74 to 297 microns)

SOURCE: MOBIL

Flotation: Both single and double stage flotation methods would be employed to concentrate the phosphate (Figure 2.4-D). Single stage rougher flotation would be used to concentrate the sizer rock product, while double stage flotation of the coarse and fine feed would be used to concentrate the phosphatic sand. Rougher flotation would float the phosphatic particles from the sand using fatty acid reagents. The rougher product would then be subjected to a de-oil bath and would be routed to cleaner flotation. The cleaner flotation would utilize amine reagents to float the remaining sand to achieve final concentration of the product. Reagents to be used in the flotation process are #5 fuel oil, caustic, fatty acid, amine, kerosene, and sulfuric acid. The final phosphate concentrate would be dewatered and held in storage bins prior to transfer to rail cars for shipment to Nichols.

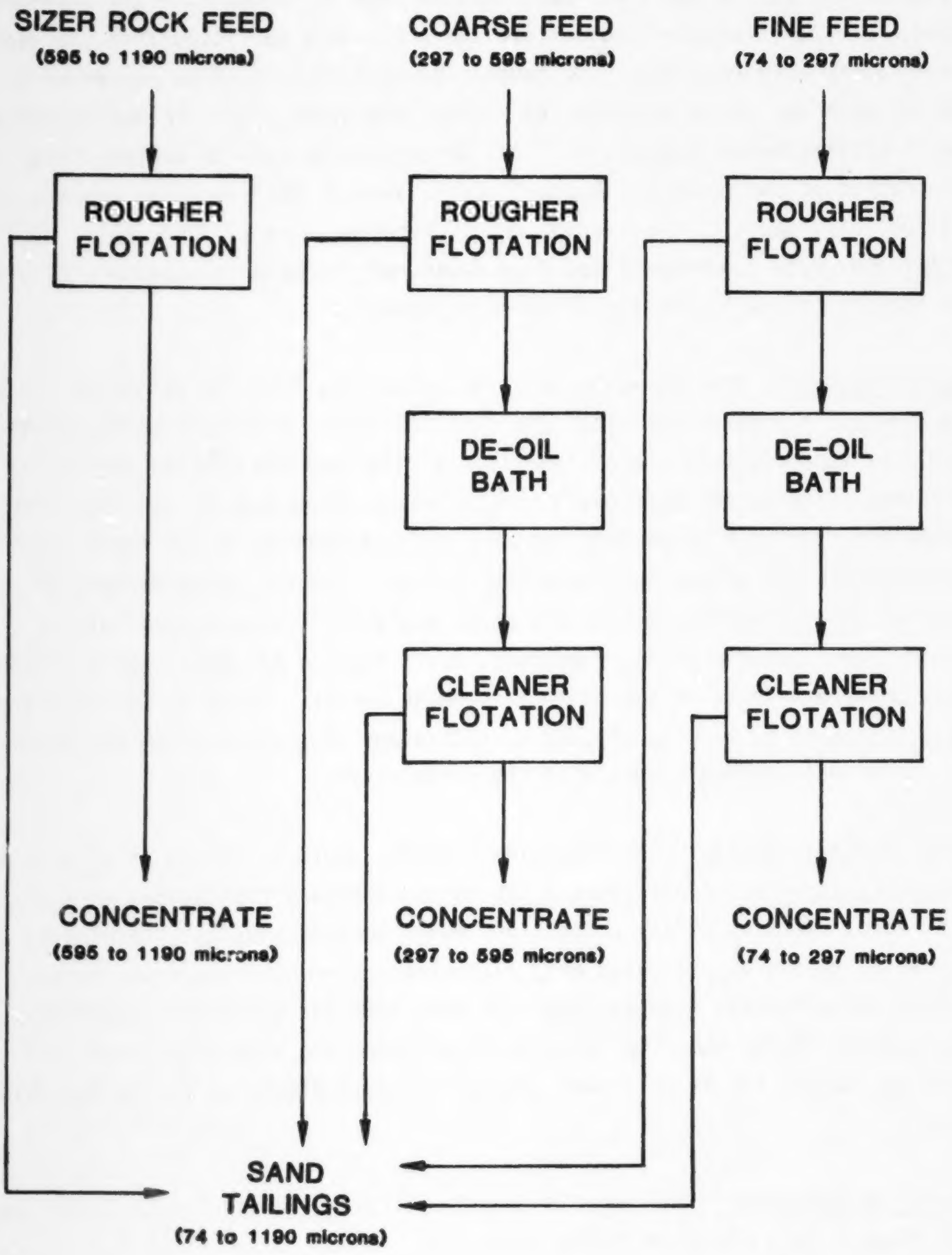
Waste Products: The two waste materials separated from the phosphate during washing and flotation are clays and sand tailings. Estimated waste quantities would be approximately 132 million tons of clay and 158 million tons of sand tailings. The waste clays would contain about 23 percent of the recoverable phosphate (particle sizes less than 200 mesh) contained in the matrix that state-of-the-art processing technology cannot recover. Approximately 12 percent of the recoverable matrix phosphate would be lost with sand tailings. Conventional beneficiation, therefore, would recover 65 percent of the recoverable phosphate found in the South Fort Meade matrix. Mobil is pursuing a research program to develop processing technology that would allow the recovery of additional phosphate lost with the waste clays.

Bulk Chemical Storage: The flotation reagents would be stored on site in vertical, cylindrical, steel tanks built on above-ground foundations in a diked tank farm. Routine safety precautions would include thorough training of operating personnel, allowing only authorized personnel to operate pumps, valves and controls, lighting the tank farm area and periodic inspections. The surface inside the diked area would be paved and sloped to direct any spillage and/or runoff to a sump pump which would discharge to the flotation plant.

Energy Requirements: Conventional beneficiation would require 12,100 kW during Phase I, and 18,200 kW during Phase II.

FIGURE 2.4-D

FLOTATION PROCESS


SIZER ROCK FEED
(595 to 1190 microns)
COARSE FEED
(297 to 595 microns)
FINE FEED
(74 to 297 microns)
ROUGHER FLOTATION
ROUGHER FLOTATION
ROUGHER FLOTATION
DE-OIL BATH
DE-OIL BATH
CLEANER FLOTATION
CLEANER FLOTATION
CONCENTRATE
(595 to 1190 microns)
CONCENTRATE
(297 to 595 microns)
CONCENTRATE
(74 to 297 microns)
SAND TAILINGS
(74 to 1190 microns)

SOURCE: MOBIL

Environmental Control Measures: The production areas of the washing facilities, feed preparation unit and flotation process would be individually paved, curbed and sloped to contain any spillage, clean-up water and rainwater. Water collected would be pumped back to its respective area. During plant construction and operation, perimeter ditches would be used to collect runoff from the plant area. Roads in the plant area will be paved prior to construction to reduce particulate emissions.

2.4.1.2 Environmental Considerations

Environmental Advantages: Conventional benefication processing would not have significant air emissions and would not contribute noise to the off-site environment. Wet processing of the slurried matrix has little potential for generation of airborne radioactivity associated with particulates. Conventional beneficiation processing would recover 65 percent of the recoverable phosphate.

Environmental Disadvantages: Conventional beneficiation would require large amounts of water: 130.2 mgd of recycled water and 15.7 mgd of groundwater. Withdrawing groundwater would lower the piezometric level of the Lower Floridan Aquifer an average of 3.3 feet beneath the site.

Conventional processing generates clay wastes in a solution containing about three to five percent solids. Disposal of these clays would require impoundments where the water can be decanted. The volume of clay generated and amount of water entrapped in the clays would require the clay settling areas to be diked above grade.

Conventional beneficiation requires the use of several reagents in the flotation process. The reacted reagent would be discharged from the process with the waste sand tailings and clays, and most of the reagents would adhere to the clay particles. The discharge from the clear water pool would contain trace amounts of the reagents and reacted reagent-sulfate compounds.

2.4.2 DRY SEPARATION

2.4.2.1 General Description

Dry separation is a process that involves drying, crushing and sizing of the matrix. After drying with a rotary kiln and crushing with a hammermill, the matrix would be processed through several stages of air separation to separate the pebble product from the finer materials. Additional phosphate product would then be separated from the remaining material by an electrostatic separator. Less than half of the mined phosphate at the South Fort Meade site can be separated through this processing method because the ore is primarily fines and not pebble. Since the in-situ matrix in the South Fort Meade area contains about 19 percent water, large quantities of fuel would be required for the drying step.

2.4.2.2 Environmental Considerations

Environmental Advantages: Dry separation would not require significant water usage, therefore, the piezometric level of the Lower Floridan Aquifer would not be changed as a result of pumping groundwater. Waste material from the process could be disposed of in below-grade areas.

Environmental Disadvantages: The dry separation process would create a significant source of SO_2 and NO_x emissions resulting from the burning of fuels to dry the matrix. There would also be greater fugitive dust and noise levels than through the conventional benefication process. The dry separation process would have the potential for generating large amounts of clay and dust-sized particulates which could lead to radiation exposure through inhalation. The efficiency of recovery of phosphate by dry separation would be less than by conventional beneficiation. Dry separation would consume considerably more energy than conventional beneficiation.

2.4.4 SUMMARY COMPARISON

There are significant environmental disadvantages to both methods of processing. Conventional processing would utilize large quantities of water and would generate waste clay that would have to be disposed of in above-grade clay settling areas. Dry processing would create significant air emissions and would consume large quantities of energy. Conventional benefication recovers about 65 percent of the recoverable phosphate while the dry separation process recovers about 50 percent of the recoverable phosphate. The conventional beneficiation process is considered to create slightly less environmental impacts and is, therefore, the environmentally preferred method of matrix processing.

2.5 WASTE DISPOSAL ALTERNATIVES

Various alternatives have been considered to address the concerns of disposal of waste clay from phosphate mining. At Mobil's South Fort Meade Mine the matrix sand/clay ratio (1.2:1) is very low when compared to other phosphate mining operations in the area (Table 2.5-1). This increases the quantity of waste clay that must be disposed of in relation to the sand tailings. Mobil evaluated thirty waste disposal techniques, and after considerable screening and review with EPA, three main disposal concepts were selected for detailed evaluation. These concepts included: 1) conventional waste clay and sand tailings disposal as currently practiced by the phosphate industry, 2) mixing sand tailings with thickened clay wastes, and 3) mixing overburden sand and sand tailings with clay wastes. When the three waste disposal concepts were combined in alternative disposal schemes, the following four waste disposal cases were developed for final consideration: 1) conventional clay settling, 2) sand/clay cap, 3) sand/clay mix, and 4) overburden/clay mix. Mobil's proposed action is the conventional clay settling case and is described in Section 2.5.1. Each alternative waste disposal method is addressed in the following sections.

2.5.1 CONVENTIONAL CLAY SETTLING CASE (MOBIL'S PROPOSED ACTION)

2.5.1.1 General Description

Mobil proposes to use conventional methods for disposal of waste sand tailings and clay. Sand tailings would be principally used to backfill mined areas (5,034 acres). Waste clays would be contained behind earthen dikes constructed on natural ground (1,320 acres) or constructed in mined areas (8,363 acres). Average dike heights would be 38.7 feet above grade. The estimated power consumption for pumping waste sand and clays would be 1,004 x 10^6 kWh over the life of the mine. A discussion of disposal methods for clay, sand tailings, and overburden are presented below for the conventional clay settling case.

Waste Clay Disposal: Substantial quantities of water (11.6 mgd) would be entrained in the waste clays, increasing their volume and requiring considerable storage area for settling basins. The conventional disposal plan would discharge waste clays at three to five percent solids behind earthen dikes for consolidation and water decanting. Two to four years after the pond is taken out of service, the clay wastes would consolidate to about 20 percent solids.

TABLE 2.5-1

SUMMARY OF MATRIX SAND/CLAY RATIOS

Company	Mine	Matrix Sand/Clay Ratios
Grace	Four Corners	4.5:1
Estech	Duette	4.2:1
Beker	Manatee	4.0:1
AMAX	Pine Level	3.75:1
Borden	Big Four	3.2:1
Brewster	Ft. Lonesome	2.5-3:1
CF Industries	Hardee Co.	2.6:1
Farmland	Hardee	2.5:1
Mississippi Chemical	Hardee Co.	2.2:1
Mobil	South Fort Meade	1.2:1

SOURCE: Ratios calculated from published information including DRI Applications.

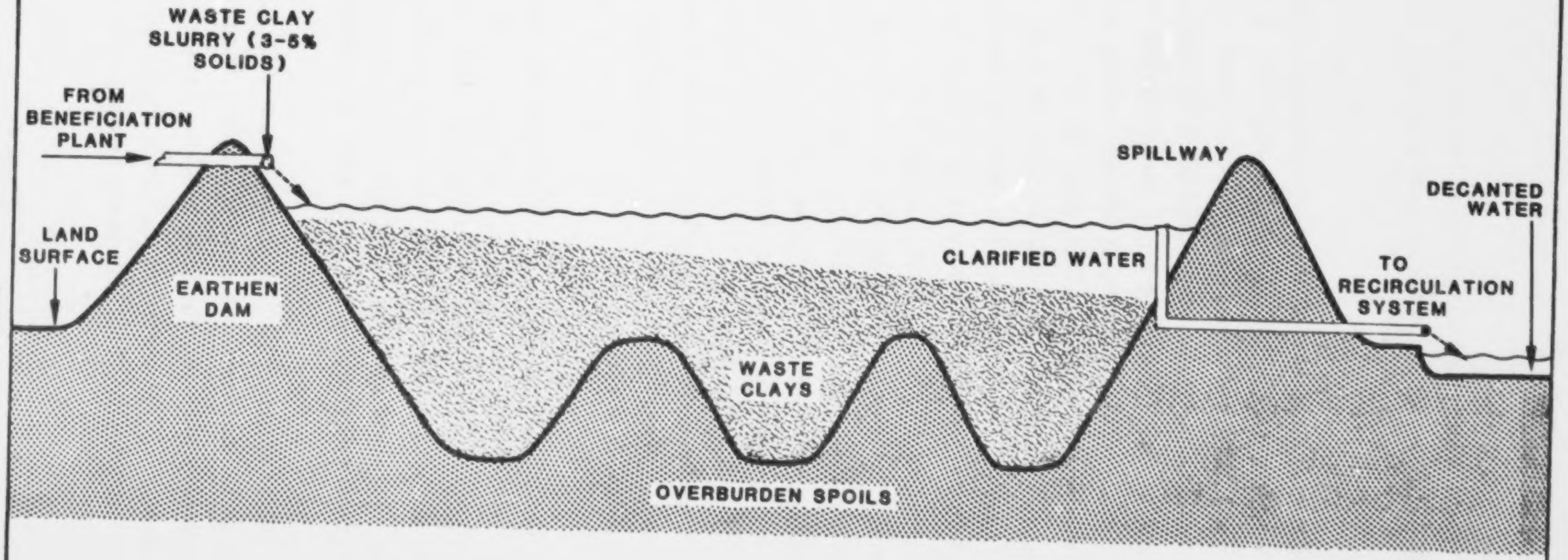
During waste disposal operations clarified water would be drawn off through the spillways by gravity and would be recirculated into the plant system (Figure 2.5-A).

Figure 2.5-B shows the locations of the clay settling areas proposed for the South Fort Meade Mine. Approximately 328,000 acre-feet of waste clays would be stored in a total of 9,683 acres. The initial waste clay settling areas, CS-1 and CS-2, would be built on unmined ground with dikes constructed of overburden material. These settling areas would contain the waste clays generated during the first five years of mining. After construction of CS-1 and CS-2, all other waste disposal areas would be constructed on mined land. All the clay wastes generated during the life of the mine would be contained in Areas CS-1 through CS-14. However, a portion of the clay wastes allocated to Area CS-14 would be transferred to CS-15 to provide below-grade fill for the last mining area on the site. This low level fill would provide a shallow aquatic environment for eventual reclamation as a wetland. No dike is planned for CS-15 since the fill level would be approximately three feet below natural grade. A portion of the clay fill for CS-15 would be obtained by flowing clay slurry through CS-14 until that area approaches natural grade. The transfer of clay slurry from CS-14 to CS-15 would continue by pumping clays out of CS-14 until the clay level in CS-14 averages three feet below existing grade. This would leave both Areas CS-14 and CS-15 approximately three feet below grade for reclamation as wetlands.

After the areas are allowed a period of consolidation, sand tailings would be used to cap all the interior of Areas CS-1 and CS-2 to an average depth of two feet, and a portion of the interior of Areas CS-4, CS-5, CS-6 and CS-7 to an average depth of 8 to 10 feet. The sand cap would enhance the structural stability of the reclaimed surface. Acreages, dike heights, fill levels and reclaimed elevations for all clay settling areas are shown in Table 2.5-2.

A flow through settling technique is commonly used with conventional clay settling and would be implemented at the South Fort Meade mine. This technique is generally utilized for clay settling basins that are located adjacent to each other. The procedure consists of introducing the waste clay stream into a series of clay settling basins instead of a single basin. The

WASTE CLAY SETTLING METHOD


WASTE CLAY
SLURRY (3-5% SOLIDS)
FROM BENEFICIATION PLANT
LAND SURFACE
EARTHEN DAM
WASTE CLAYS
OVERBURDEN SPOILS
CLARIFIED WATER
SPILLWAY
TO RECIRCULATION SYSTEM
DECANTED WATER

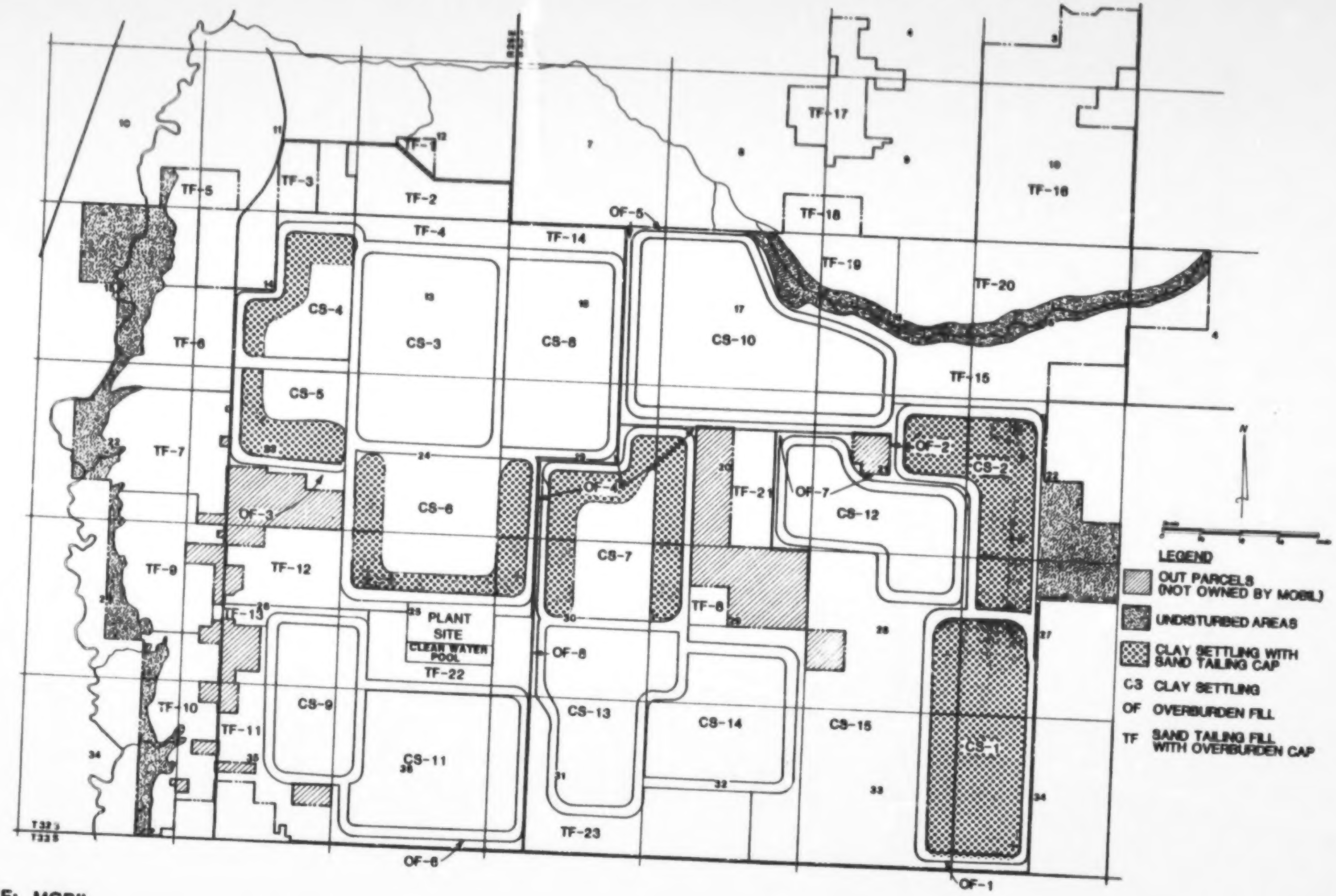
SOURCE: MOBIL

NOTE: NOT TO SCALE

FIGURE 2.5-A

FIGURE 2.5-B

CONVENTIONAL WASTE DISPOSAL CASE


LEGEND
OUT PARCELS (NOT OWNED BY MOBIL)
UNDISTURBED AREAS
CLAY SETTLING WITH SAND TAILING CAP
CS CLAY SETTLING
OF OVERBURDEN FILL
TF SAND TAILING FILL WITH OVERBURDEN CAP
N
CS-1
CS-2
CS-3
CS-4
CS-5
CS-6
CS-7
CS-8
CS-9
CS-10
CS-11
CS-12
CS-13
CS-14
CS-15
OF-1
OF-2
OF-3
OF-4
OF-5
OF-6
OF-7
OF-8
TF-1
TF-2
TF-3
TF-4
TF-5
TF-6
TF-7
TF-8
TF-9
TF-10
TF-11
TF-12
TF-13
TF-14
TF-15
TF-16
TF-17
TF-18
TF-19
TF-20
TF-21
TF-22
TF-23
PLANT SITE
CLEAN WATER POOL
T32S
T33S

SOURCE: MOBIL

TABLE 2.5-2

ACREAGES, DIKE HEIGHTS, FILL LEVELS AND RECLAIMED ELEVATIONS FOR CLAY SETTLING AREAS

(Conventional Case)

				Elevation Relative To Existing Grade			
Area	Total Acreage	Sand Capped Acreage	Uncapped Acreage*	Dike Height (ft.)	Clay Fill Level (ft.)	Approximate Reclaimed Elevation (ft.) for Capped Portion	Approximate Reclaimed Elevation (ft.) for Uncapped Portion
CS-1	780	653	127	45	40	45	--
CS-2	540	427	113	45	40	45	--
CS-3	840	--	840	45	40	--	34
CS-4	385	60	325	45	40	45	34
CS-5	300	60	240	45	40	45	34
CS-6	750	143	607	35	30	35	25
CS-7	735	146	589	35	30	35	25
CS-8	620	--	620	35	30	--	25
CS-9	400	--	400	35	30	--	25
CS-10	1,020	--	1,020	35	30	--	26
CS-11	690	--	690	35	30	--	25
CS-12	520	--	520	35	30	--	25
CS-13	590	--	590	40	35	--	30
CS-14	520	--	520	25	-3	--	-4
CS-15	993	--	993	0	-3	--	-4
Total	9,683	1,489	8,194				

* Uncapped acreage includes both dike acreage and interior acreage without a sand cap.

Average dam height = 38.7 feet

SOURCE: MOBIL

advantages of the flow through settling technique are improved water clarification, clay compaction, and water management. The specific filling schedule and active settling acreage for the conventional waste disposal case using the flow through settling technique are shown in Table 2.5-3.

Sand Tailings Disposal: Sand tailings would be used as backfill in mined areas, in the construction of earthen dikes and for capping material. Approximately 76 percent of the sand tailings generated during the life of the mine would be utilized in tailings fill areas. There would be 23 tailings fill areas totaling 5,034 acres (Figure 2.5-B). Table 2.5-4 summarizes the acreages of these areas.

Sand tailings fill areas would receive slurried sand tailings pumped from the processing plant to mined areas, filling voids between the piles of overburden stacked during mining. The decanted water from the sand tailings would be directed to the water recirculation system. Overburden extending above the level of the sand tailings would be graded, bringing the mined land to approximate natural grade with an average overburden cap of two feet. About five million tons of sand tailings would be used as fill material in the construction of earthern dikes for the disposal of clay wastes. Approximately 32.5 million tons of sand tailings would be used as a cap on the clay settling areas.

Overburden: Overburden would be used to backfill mined lands, for construction of waste clay storage areas and for capping sand tailings fill areas. Eight overburden fill areas totaling 308 acres are included in the waste disposal plan (Figure 2.5-B).

2.5.1.2 Environmental Considerations

Environmental Advantages: The conventional clay settling case alternative provides the greatest potential for future recovery of recoverable phosphate when advanced technology is developed. The clay impoundments (9,683 acres) would contain phosphate in the most concentrated, uncontaminated form (tons of recoverable phosphate per ton of waste). This waste disposal method also consumes the least energy of all the alternatives. Clay settling basins are self-sealing, preventing seepage to the Surfical Aquifer of water containing

TABLE 2.5-3

ACTIVE SETTLING ACREAGE OF ABOVE-GRADE BASINS
(Conventional Clay Settling Case)

Settling Area	Acreage	Begin Clay Fill (Mine Year)	Complete Clay Fill (Mine Year)	Active Settling Acreage
CS-1*	780	1	4	780
CS-2*	540	3	4	1,320
CS-3	840	3	8	840
CS-4**	385	8	15	385
CS-5**	300	9	15	685
CS-6**	750	10	15	1435
CS-7**	735	12	15	2170
CS-8**	620	14	15	2760
CS-9	400	15	16	400
CS-10	1,020	16	18	1020
CS-11	690	18	20	690
CS-12	520	20	21	520
CS-13	590	21	23	590

---

* CS-1 and CS-2 would be operated by the flow through settling technique.

**CS-4, CS-5, CS-6, CS-7, and CS-8 would be operated by the flow through settling technique, which means that water and unconsolidated clays flow throughout the system from the beginning of clay fill for an individual settling area until the completion of clay fill in the last basin within this group (e.g., CS-4 is active in mine years 8-15 and CS-6 in mine years 10-15).

SOURCE: MOBIL

TABLE 2.5-4

SAND TAILINGS FILL ACREAGE
(Conventional Case)

Area		Acreage
TF-1		20
TF-2		211
TF-3		73
TF-4		131
TF-5		135
TF-6		265
TF-7		315
TF-8		40
TF-9		286
TF-10		300
TF-11		135
TF-12		210
TF-13		20
TF-14		102
TF-15		365
TF-16		760
TF-17		214
TF-18		80
TF-19		147
TF-20		466
TF-21		120
TF-22		230
TF-23		409
	Total	5,034

NOTE: Total acreage includes setbacks from public roads and property boundaries which will be disturbed but not mined.

SOURCE: MOBIL

contaminants from mining and processing. The conventional clay settling case is a proven operating technique that presents the least process risk.

Environmental Disadvantages: This case would have the greatest acreage of above-grade clay settling basins (8,170 acres) with the highest average dike height (38.7 feet). Approximately 11.6 mgd of water would become entrained with the waste clay and would require a long period of time to dewater. The clay basins are expected to reach 22 percent solids after five years of dewatering. The conventional case has the greatest amount of active above-grade clay settling area (2,760 acres) at a given time. This case, therefore, has the highest probability for dike failure and a resulting spill.

2.5.2 SAND/CLAY CAP CASE

2.5.2.1 General Description

The following four general types of waste disposal areas are included in the sand/clay cap alternative waste disposal case:

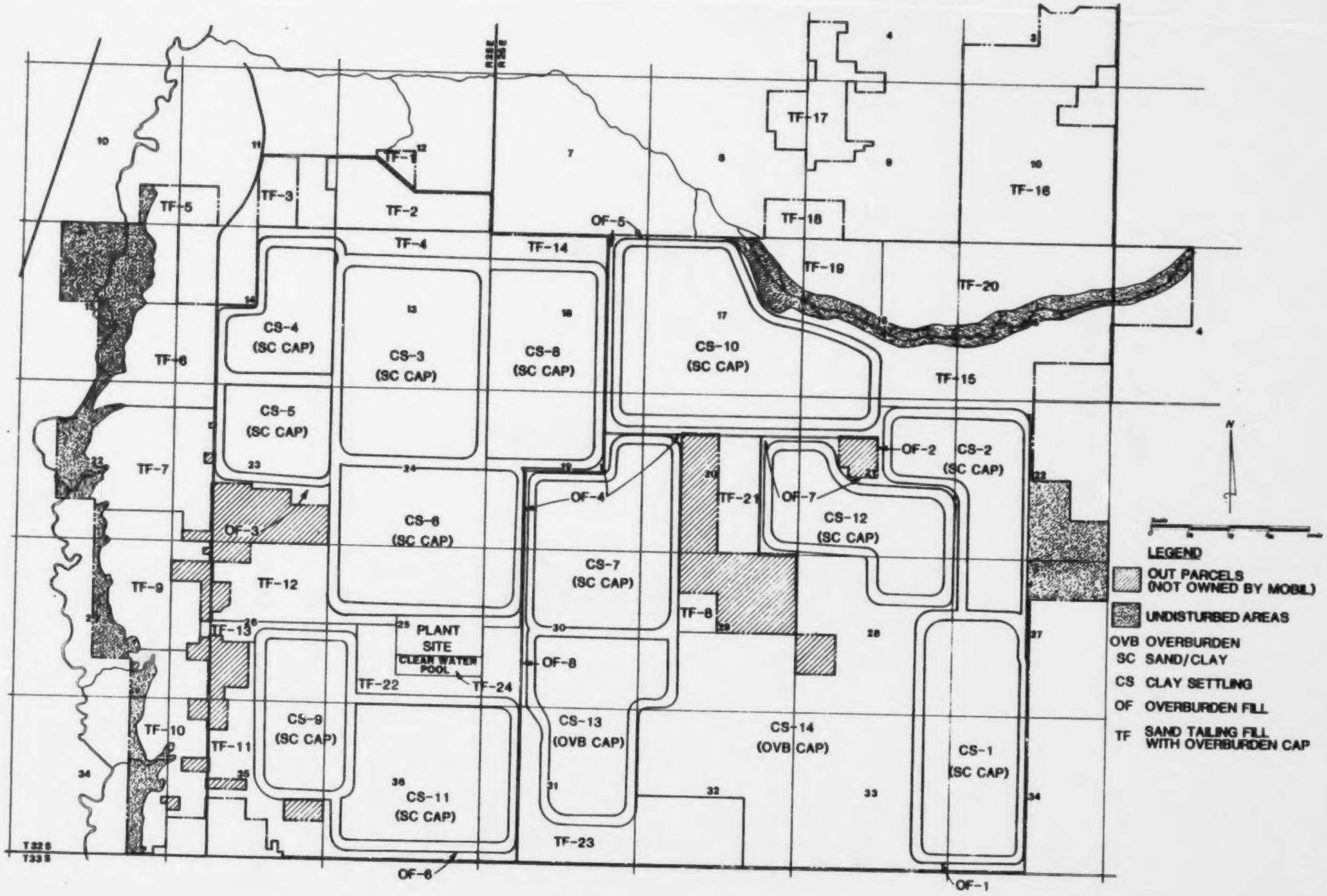
- Above-grade clay settling areas with a sand/clay mix cap (7,580 acres)
- Above-grade clay settling areas with an overburden cap (590 acres)
- Below-grade clay settling areas with partial overburden cap (1,513 acres)
- Sand tailings fill areas with an overburden cap (5,079 acres)
- Overburden fill areas (308 acres)

The distribution of these areas on the site is shown in Figure 2.5-C. The average dike height for this plan is 36.7 feet. The estimated power consumption for pumping waste sand and clay in this waste disposal case would be 1,253 x 10^6 kWh over the life of the mine.

Clay Settling Areas: Fourteen areas would receive clay wastes during the life of the mine. Proposed acreages, dike heights, fill levels, and reclaimed elevations are summarized for all clay settling areas in Table 2.5-5. Two settling areas, CS-1 and CS-2, would be constructed on unmined ground to receive all the clay wastes generated during the first four or five years of mine life. By year 5, Area CS-3 would have been constructed in the initial mining area and would begin to receive clay wastes. Areas CS-4 through CS-13 would then be used in numerical sequence to contain clay wastes. Flow through

FIGURE 2.5-C

WASTE DISPOSAL AREAS - SAND/CLAY CAP


R25E
R26E
T32S
T33S
TF-1
TF-2
TF-3
TF-4
TF-5
TF-6
TF-7
TF-8
TF-9
TF-10
TF-11
TF-12
TF-13
TF-14
TF-15
TF-16
TF-17
TF-18
TF-19
TF-20
TF-21
TF-22
TF-23
TF-24
CS-1 (SC CAP)
CS-2 (SC CAP)
CS-3 (SC CAP)
CS-4 (SC CAP)
CS-5 (SC CAP)
CS-6 (SC CAP)
CS-7 (SC CAP)
CS-8 (SC CAP)
CS-9 (SC CAP)
CS-10 (SC CAP)
CS-11 (SC CAP)
CS-12 (SC CAP)
CS-13 (OVB CAP)
CS-14 (OVB CAP)
OF-1
OF-2
OF-3
OF-4
OF-5
OF-6
OF-7
OF-8
PLANT SITE
CLEAR WATER POOL
N
LEGEND
OUT PARCELS (NOT OWNED BY MOBIL)
UNDISTURBED AREAS
OVB OVERBURDEN
SC SAND/CLAY
CS CLAY SETTLING
OF OVERBURDEN FILL
TF SAND TAILING FILL WITH OVERBURDEN CAP

SOURCE: ZELLARS-WILLIAMS

TABLE 2.5-5

CLAY SETTLING AREAS
(Sand/Clay Cap Case)

		Elevation Relative To Natural Grade		
Area	Total Acreage	Dike Height (ft.)	Fill Level (ft.)	Approximate Reclaimed Elevation (ft.)
CS-1	780	45	40	34
CS-2	540	45	40	34
CS-3	840	45	40	31
CS-4	385	35	30	23
CS-5	300	35	30	23
CS-6	750	35	30	23
CS-7	735	35	30	23
CS-8	620	35	30	23
CS-9	400	30	25	19
CS-10	1,020	30	25	18
CS-11	690	35	30	23
CS-12	520	35	30	23
CS-13*	590	32	27	1
CS-14*	1,513	0	-3	-5
Total	9,683			

---

* Areas capped with overburden; all others capped with sand/clay mix

SOURCE: ZELLARS-WILLIAMS

settling cannot be used with the sand/clay cap disposal method. In order to place the sand/clay cap over the clay settling areas in a timely fashion, the basins must be taken out of service after the initial fill and actively dewatered to develop a crust. Table 2.5-6 shows the filling schedule for the above-grade clay settling basins, their acreages and the mining years during which the respective basins are active.

After a period of consolidation, Areas CS-1 through CS-12 would receive a second fill and cap of sand/clay mix at a ratio of 4:1. A minimum consolidation period of three years would be allowed between final clay fill and placement of the sand/clay cap. The subsidence in the clay fill during this period determines the exact depth of the cap which would range from four to six feet. The sand/clay cap would extend over approximately 95 percent of the total surface of the area. The remaining five percent would be left uncapped in order to create shallow depressions suitable for reclamation as wetlands.

The sand/clay mix would be made by mixing prethickened clays with sand tailings. Area CS-3 would be used throughout most of the mine life for thickening the clays prior to mixing with sand. Clay slurry would enter this area at three to five percent solids. When the clays were consolidated to approximately 15 percent solids, the thickened clays would be dredged out for mixing with a suspension of sand tailings.

An overburden cap is planned for Area CS-13. The clay level in this area would remain approximately 10 feet above grade following dredge removal of clay fill to Areas CS-3 and CS-14. This level of fill would leave sufficient material in the retaining dike and protruding spoil piles to provide a partial overburden cap averaging one foot thick over the area.

Sand Tailings Fill Areas: Approximately 76 percent of the sand tailings generated during the life of the mine would be utilized in tailings fill areas. Twenty-four tailings fill areas, totaling 5,079 acres, are included in this case; acreages for these areas are summarized in Table 2.5-7. The areas would be filled with sand tailings to near natural grade. The overburden spoil piles would then be graded over the fill to achieve an overburden cap averaging approximately two feet in depth.

TABLE 2.5-6

ACTIVE SETTLING ACREAGE OF ABOVE-GRADE BASINS
(Sand/Clay Cap Case)

Settling Area	Acreage	Begin Clay Fill (Mine Year)	Complete Clay Fill (Mine Year)	Active Settling Acreage
CS-1	780	1	4	780
CS-2	540	1	6	1,320
CS-3*	840	5	8	840
CS-4	385	8	10	1,225
CS-5	300	10	11	1,140
CS-6	750	11	13	1,590
CS-7	735	13	15	1,575
CS-8	620	15	16	1,460
CS-9	400	16	17	1,240
CS-10	1,020	17	19	1,860
CS-11	690	19	21	1,530
CS-12	520	21	22	1,360
CS-13	590	22	27	590

---

* CS-3 would be used as a dredge basin and alternately filled and emptied during mine years 5 through 27.

SOURCE: ZELLARS-WILLIAMS

TABLE 2.5-7

SAND TAILINGS FILL AREAS
(Sand/Clay Cap Case)

Area	Total Acreage
TF-1	20
TF-2	211
TF-3	73
TF-4	131
TF-5	135
TF-6	265
TF-7	315
TF-8	40
TF-9	286
TF-10	300
TF-11	135
TF-12	210
TF-13	20
TF-14	102
TF-15	365
TF-16	760
TF-17	214
TF-18	80
TF-19	147
TF-20	466
TF-21	120
TF-22	230
TF-23	409
TF-24	45
Total	5,079

SOURCE: ZELLARS-WILLIAMS

Overburden Fill Areas: Eight overburden fill areas totaling 308 acres and consisting of relatively small, irregularly shaped parcels adjacent to waste disposal dikes would be utilized in the sand/clay cap waste disposal case.

2.5.2.2 Environmental Considerations

Environmental Advantages: The average dike height of the above-grade settling areas would be reduced two feet as compared to the conventional case. The maximum active settling acreage is reduced (1,860 acres versus 2,760 acres for conventional); therefore, the probability of a dike failure is least for the sand/clay cap case. The clay waste would seal the above-grade basins and prevent possible seepage of contaminants from the basins into the Surficial Aquifer. This method of disposal would impound 93 percent of the waste clay in an uncontaminated form that would allow recoverable phosphate reserves to be mined and processed at a future date when advanced technology becomes available (0.35 tons of phosphate per ton of waste sand and clay). With the sand/clay cap case, approximately 1,252 x 10^6 kWh of power would be required for sand and clay pumping during the mine life. This is 25 percent greater than the conventional clay settling case but considerably less than the other alternative. (See Table 2.5-11 for values.)

Environmental Disadvantages: This case would have only 8,170 acres of above-grade clay settling basins (equal to the conventional case) and more than the other two cases. Approximately 11.6 mgd of water would become entrained in the waste clay and would require a long period of time to dewater. The sand/clay cap method of waste disposal has not been practiced before and would, therefore, represent some risk of being unsuccessful.

2.5.3 SAND/CLAY MIX CASE

2.5.3.1 General Description

The sand/clay mix waste disposal method would involve mixing gravity thickened clays with dewatered sand tailings and depositing the mixture in mined areas for consolidation and stabilization. The clays would be pumped from the settling/thickening areas to the mix area and disposal sites. Sand to clay ratios of 2:1 have been shown to be the minimum ratio to achieving significant consolidation benefits. The high clay content in the South Fort Meade Mine matrix would preclude the use of sand/clay mix techniques of waste disposal for the whole site. A combination of sand/clay mix areas and conventional sand and clay disposal areas would be required in disposing of the wastes. The following six general types of waste disposal areas are included in the sand/clay mix case:

- o Clay settling areas (3,737 acres)
- o Sand tailings fill areas (3,020 acres)
- o Sand/clay mix areas (3,512 acres)
- o Clay settling areas with a sand/clay mix cap (3,185 acres)
- o Graded spoil (838 acres)
- o Overburden fill areas (733 acres)

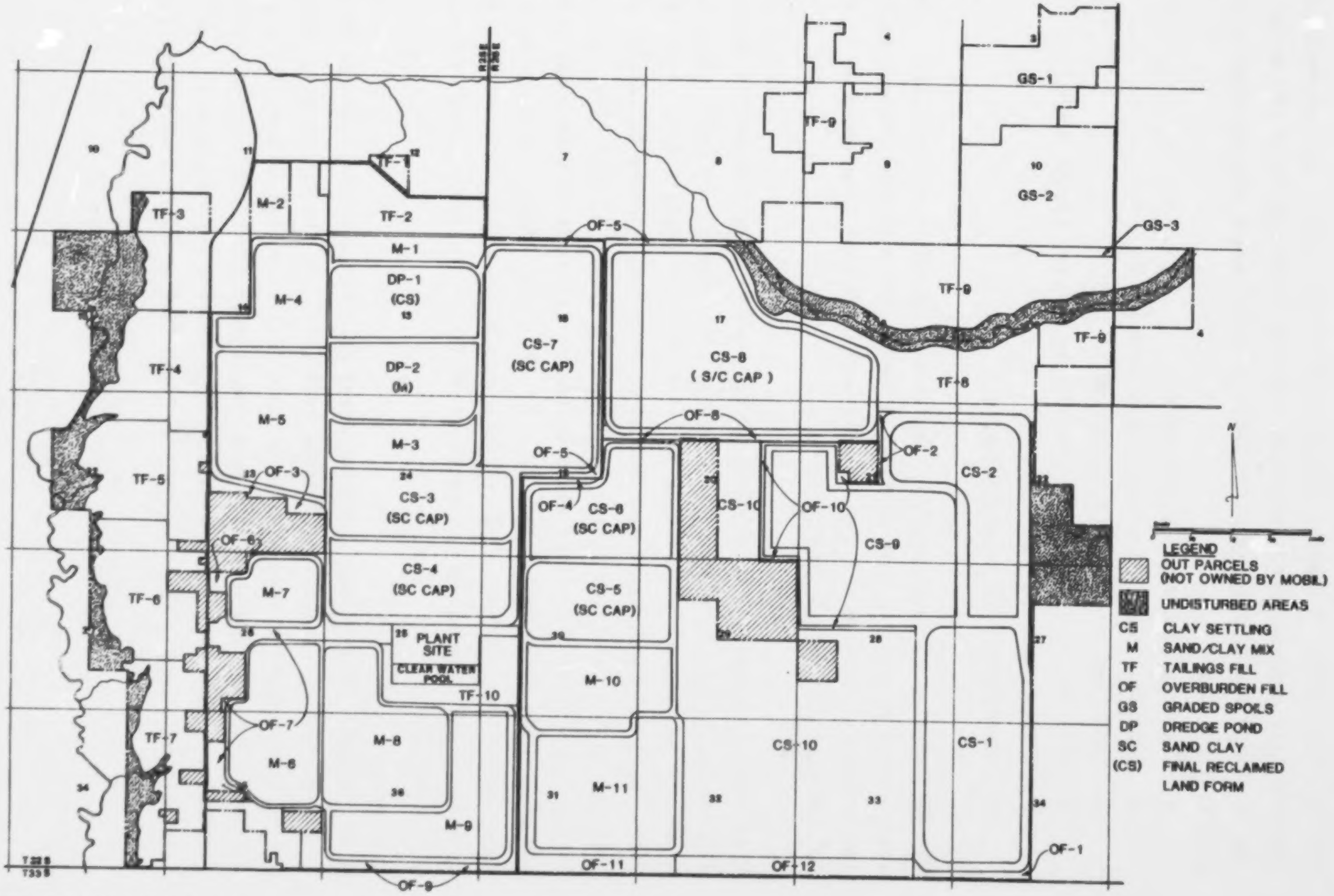
The distribution of these areas on the site is shown in Figure 2.5-D. The average dike height for this plan is 35 feet. The estimated power consumption for pumping waste sand and clay in this waste disposal case would be 1,358 x 10^6 kWh over the life of the mine.

Clay Settling Areas: A total of 11 areas would receive clay wastes during the life of the mine. Acreages, dike heights, fill levels, and reclaimed elevations are summarized for the clay settling areas in Table 2.5-8. Two settling areas, CS-1 and CS-2, would be constructed on unmined ground to receive all the clay wastes generated during the first four years of mine life. Beginning in year 5, a portion of clays would be routed to the two dredge ponds (DP-1 and DP-2) with the excess going to CS-2. When the sand/clay mix method becomes operational in year 6, Areas CS-2 through CS-9 would be used in sequence to contain the clay wastes generated in excess of the sand/clay mixing capacity of the mine.

A second stage fill of clay settling Areas CS-1 through CS-8 would be employed to fully utilize the storage capacity available. As the clays consolidate, the spillway overflow levels would be continually lowered to keep the areas drained. The subsidence in fill level would make additional storage volume available. Areas CS-3 through CS-8 would receive a second stage fill of five feet of sand/clay mix (2:1). Areas CS-1 and CS-2 would receive clay alone as the second stage fill.

FIGURE 2.5-D

WASTE DISPOSAL AREAS - SAND/CLAY MIX


GS-1
GS-2
GS-3
TF-1
TF-2
TF-3
TF-4
TF-5
TF-6
TF-7
TF-8
TF-9
TF-10
M-1
M-2
M-3
M-4
M-5
M-6
M-7
M-8
M-9
M-10
M-11
DP-1 (CS)
DP-2 (M)
CS-1
CS-2
CS-3 (SC CAP)
CS-4 (SC CAP)
CS-5 (SC CAP)
CS-6 (SC CAP)
CS-7 (SC CAP)
CS-8 (S/C CAP)
CS-9
CS-10
OF-1
OF-2
OF-3
OF-4
OF-5
OF-6
OF-7
OF-8
OF-9
OF-10
OF-11
OF-12
PLANT SITE
CLEAR WATER POOL
R25E
R26E
T32S
T33S
N
LEGEND
▨ OUT PARCELS (NOT OWNED BY MOBIL)
▩ UNDISTURBED AREAS
CS CLAY SETTLING
M SAND/CLAY MIX
TF TAILINGS FILL
OF OVERBURDEN FILL
GS GRADED SPOILS
DP DREDGE POND
SC SAND CLAY
(CS) FINAL RECLAIMED LAND FORM

SOURCE: ZELLARS-WILLIAMS

TABLE 2.5-8

CLAY SETTLING AREAS
(Sand/Clay Mix Case)

		Elevation Relative To Natural Grade		
Area	Total Acreage	Dike Height (ft.)	Fill Level (ft.)	Approximate Reclaimed Elevation (ft.)
CS-1	780	48	43	38
CS-2*	540	48	43	38
CS-3*	390	48	43	35
CS-4*	380	48	43	35
CS-5*	360	48	43	35
CS-6*	360	48	43	35
CS-7*	675	48	43	36
CS-8	1,020	35	30	25
CS-9	650	20	-2	-3
CS-10	1,445	0	-3	-4
DP-1	322	37	10	7
Total	6,922			

* Capped with sand/clay mix

SOURCE: ZELLARS-WILLIAMS

Area CS-10 would receive below-grade clay fill beginning in year 22 and continuing until year 27. No dike is planned for this area since the fill level would be approximately 2.5 feet below natural grade. This area would provide a shallow aquatic environment for reclamation as a wetland area.

Sand Tailings Fill Areas: Approximately 41 percent of the sand tailings generated during the life of the mine would be utilized in ten tailings fill areas. Acreages and reclaimed elevations are summarized for the tailings fill areas in Table 2.5-9. With the exception of TF-9, all the areas would be filled with sand tailings to within two feet of natural grade. The overburden spoil piles would then be graded over the fill to achieve an overburden cap averaging two feet in depth. Area TF-9, north of Bowlegs Creek, would be filled with approximately five feet of sand tailings. When capped with overburden, this level of fill would result in a reclaimed land surface that would be below natural grade but above the water table.

Sand/Clay Mix Areas: Approximately 35 percent of the total waste clay and 59 percent of the total sand generated during mine life would be mixed at a 2:1 sand to clay ratio and placed either in sand/clay mix areas or used to cap clay settling areas (Table 2.5-8). Twelve sand/clay mix areas totaling 3,512 acres and six clay settling areas capped with sand/clay mix totaling 3,185 acres would be developed with this waste disposal method.

The first sand/clay mix areas are scheduled to be filled in year 6 of the mine life. These areas would be reclaimed as wetlands requiring them to be filled only to near natural grade. They would be allowed to subside until year 8 when they would be filled again to capacity with sand/clay mix. The remaining ten sand/clay mix areas would be designed to allow for subsidence to above natural grade. Table 2.5-10 summarizes dike heights, original fill levels, reclaimed elevations and acreages planned for the various sand/clay mix areas.

Dike heights of 20 feet are planned for the majority of the sand/clay mix areas. Only three areas would have dike heights of 30 feet or higher. Elevations of reclaimed sand/clay landfills are projected to be at approximately

TABLE 2.5-9

SAND TAILINGS FILL AREAS
(Sand/Clay Mix Case)

Relative Area	Total Acreage*	Reclaimed Elevation To Natural Grade (ft.)
TF-1	20	0
TF-2	218	0
TF-3	124	0
TF-4	270	0
TF-5	306	0
TF-6	286	0
TF-7	311	0
TF-8	300	0
TF-9	1,050	-5
TF-10	135	0
Total	3,020	

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* Total acreage includes setbacks from public roads and property boundaries which will be disturbed but not mined.

SOURCE: ZELLARS-WILLIAMS

TABLE 2.5-10

DIKE HEIGHTS AND ELEVATIONS - MIX AREAS
(Sand/Clay Mix Case)

		Elevation Relative To Natural Grade		
Area	Total Acreage	Dike Height (ft.)	Fill Level (ft.)	Approximate Reclaimed Elevation (ft.)
M-1	102	0	0	-4
M-2	58	0	0	-3
M-3	160	35	30	21
M-4	245	20	15	8
M-5	425	20	15	9
M-6	360	20	15	9
M-7	160	20	15	8
M-8	440	30	25	16
M-9	410	20	15	8
M-10	330	20	15	8
M-11	500	20	15	8
DP-2	322	37	32	22
Total	3,512			

SOURCE: ZELLARS-WILLIAMS

eight feet above natural grade for the 20-foot diked areas and from 16 to 22 feet above grade for the areas with dikes 30 feet or higher.

Sand/clay mix at a 2:1 ratio would be used as a second stage fill and cap for six clay settling areas. The depth of the sand/clay cap in these areas would range from four to six feet. The second fill would utilize the waste storage volume available and would also place sand/clay mix as the surface soil.

Graded Spoil Areas: Three areas totaling 838 acres would be reclaimed without the use of backfill material. Areas GS-1, GS-2 and GS-3 would be graded to prevent ponding of water and would be sloped to the south towards Bowlegs Creek. Due to the rapid elevation changes, there would be sufficient slope to allow the areas to drain towards Bowlegs Creek, even though the reclaimed area would average 15 feet below natural grade.

Overburden Fill Areas: Twelve overburden fill areas totaling 733 acres are included in the sand/clay mix waste disposal alternative. During the construction of dikes the mining voids would be backfilled to near natural grade with overburden material graded from spoil piles on site and transported from adjacent mining areas.

2.5.3.2 Environmental Considerations

Environmental Advantages: This case would result in less above-grade clay settling acreage than either the conventional or sand/clay cap cases. The average dike height of the above-grade basins is least of all the cases. The 2,450 areas of active settling area is between that of the conventional clay settling case and the sand/clay cap case. In the event of a dike failure the sand/clay mix would not flow as rapidly or as far as the clay waste alone. The addition of the sand to the clay wastes would improve the drainage characteristics of the mix and the initial consolidation period for the sand/clay mix areas would be shorter than for the conventional case.

Environmental Disadvantages: The sand/clay mix disposal case still results in extensive above-grade clay settling acreage (4,505 acres). Power consumption for pumping waste sand and clay would be 1,358 x 10^6 kWh, approximately 36 percent more than required for the proposed conventional case. Because of mixing the waste clays with sand, this method of disposal would require greater effort to recover phosphate reserves at a future date when advanced technology becomes available (0.26 ton of phosphate per ton of waste sand and clay). The sand/clay mix method of waste disposal has not been practiced before and would, therefore, represent some risks concerning results. These risks would be approximately equal to those for the sand/clay cap case. The probability for a dike failure occurring is second highest of all the cases.

2.5.4 OVERBURDEN/CLAY MIX CASE

2.5.4.1 General Description

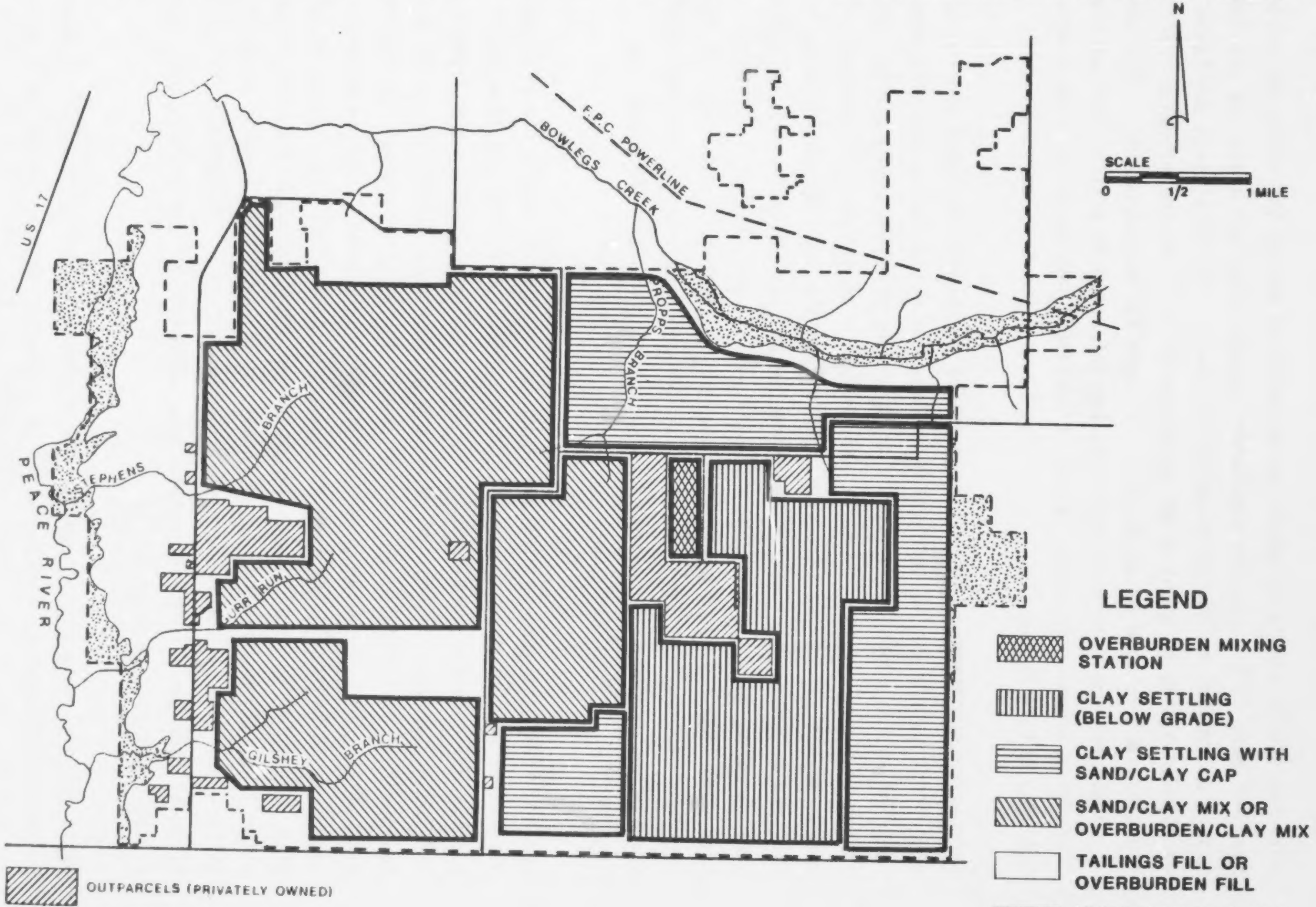
Since sufficient sand tailings are not available from the matrix to accomplish a 2:1 sand/clay mix ratio over the entire site, overburden sand could be used as an additional source of sand to mix with the waste clay. The overburden would be slurried and pumped to a field washer for screening and washing. The recovered overburden sand would then be pumped to the mixing station where it would be combined with thickened waste clay at a 2:1 sand to clay ratio for final disposal. The overburden/clay mix and other waste disposal areas are shown on Figure 2.5-E.

In order to determine the availability of overburden for use in the overburden/clay mixing scheme, information was analyzed from eight sample locations on the South Fort Meade site. The analysis indicated that the clay content of the overburden increases with depth. The upper five feet are relatively low in clay content, ranging from one to five percent. The clay content increases at depths between 5 and 15 feet, coinciding with the presence of hardpan and other clay layers. The hardpan contains substantially more clay than the upper overburden horizon and is probably a less desirable source of sand for mixing. The clay content continues to increase below the hardpan as the phosphate zone is approached at depths of more than 15 feet. The upper horizon above the hardpan unit represents the best source of available sand within the overburden section.

Not all areas of the South Fort Meade Mine site are suitable or available for overburden mining. Areas that could not be used include the following categories: areas required during the initial five years of mine life for operational considerations, areas committed to tailings backfill reclamation,

FIGURE 2.5-E

CONCEPTUAL WASTE DISPOSAL AREAS - OVERBURDEN/CLAY MIX


N
SCALE
0
1/2
1 MILE
F.P.C. POWERLINE
BOWLEGS CREEK
ROPPS BRANCH
BRANCH
RUN
GILSHEY BRANCH
STEPHENS
PEACE RIVER
US 17
LEGEND
OVERBURDEN MIXING STATION
CLAY SETTLING (BELOW GRADE)
CLAY SETTLING WITH SAND/CLAY CAP
SAND/CLAY MIX OR OVERBURDEN/CLAY MIX
TAILINGS FILL OR OVERBURDEN FILL
UNDISTURBED AREAS
OUTPARCELS (PRIVATELY OWNED)

SOURCE: STUDY DATA

environmentally sensitive areas, areas required during the sixth and seventh years of mine life to permit overburden stockpiling, and areas too shallow for practical removal by the earthmoving equipment. The total area available for overburden mixing is about 2,560 acres (25 percent) of the mineable tract with about 52 million tons of overburden available for mining/mixing. This amount of overburden would in turn stabilize approximately 26 million tons of clay. Therefore, enough overburden exists to reclaim 1,980 acres with the overburden/clay mix technique.

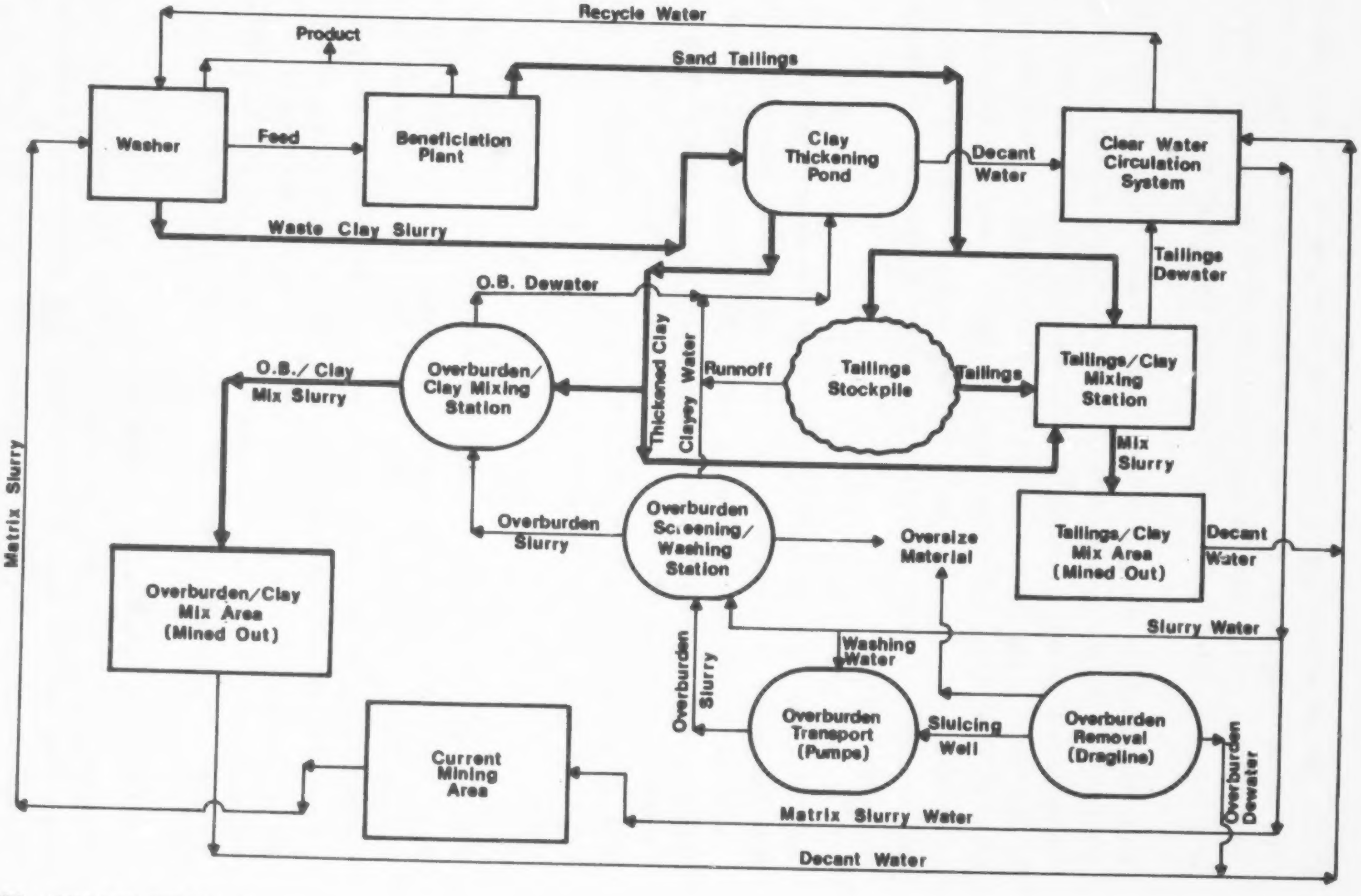
Overburden Processing: The system required to recover the sand portion of the overburden is similar to the system employed in mining and processing phosphate rock. As shown in Figure 2.5-F, a single dragline would deliver overburden to a wet pit for slurrying and hydraulic transport to a separate overburden washer. A series of screens would separate the recoverable sand from clay and organic matter. Sand recovered by the washer would then be pumped to a mix station where it would be combined with waste clay at a 2:1 ratio and then deposited for final settling. The clay wastes and organic matter would be consolidated by passing the material through a dewatering cyclone that removes excess water. The consolidated material would then be pumped to a dredge pond for thickening and then on to final disposal.

Because the matrix mining and overburden mining systems would share a common source of recycle water, contamination of products from each system would occur. While contamination of the product from one system by the product of the second can be avoided, the necessity of sharing a common source of water could result in contamination of the clear water supply feeding the beneficiation plant. Organic material and clay wastes separated at the overburden washer would be introduced into the dredge pond with the clay wastes and mixed with sand prior to final disposal. Water decanted from the sand/clay mixture after final disposal could contain substantial amounts of organic matter, which would then be returned to the clear water pool. Therefore, this waste disposal case would probably necessitate treatment of the process water used at the beneficiation plant.

Waste Disposal Details: The waste clays generated during the initial four years of mining and processing would be routed to settling areas CS-1 and

FIGURE 2.5-F

OVERBURDEN/CLAY MIXING CONCEPT


Recycle Water
Product
Sand Tailings
Washer
Feed
Beneficiation Plant
Clay Thickening Pond
Decant Water
Clear Water Circulation System
Waste Clay Slurry
Tailings Dewater
O.B. Dewater
Thickened Clay
Clayey Water
Runnoff
Tailings Stockpile
Tailings
Tailings/Clay Mixing Station
O.B./ Clay Mix Slurry
Overburden/ Clay Mixing Station
Mix Slurry
Matrix Slurry
Overburden Slurry
Overburden Screening/ Washing Station
Oversize Material
Tailings/ Clay Mix Area (Mined Out)
Decant Water
Overburden/Clay Mix Area (Mined Out)
Slurry Water
Washing Water
Overburden Slurry
Overburden Transport (Pumps)
Sluicing Well
Overburden Removal (Dragline)
Overburden Dewater
Current Mining Area
Matrix Slurry Water
Decant Water

SOURCE: ZELLARS-WILLIAMS

CS-2. The areas mined during this period would provide the area for construction of two dredge ponds for testing the sand/clay mixture disposal method. The two conventional settling areas would be filled during year 5 and the sand/clay mix system would be activated near the end of year 5.

After the sand/clay mix system becomes operational (about year 7), the overburden sand/clay mix system would be started. Matrix mining must proceed at a steady rate to permit disposal of the overburden sand/clay mixture on a continuous basis. The overburden sand/clay mixture would be disposed of in mined areas as those areas become available. Disposal areas must be prepared on an annual basis to accommodate the overburden sand/clay mix. This requires smaller disposal areas and increases both the perimeter and the height of the impoundment dikes.

Ten fill areas totaling 3,020 acres would be used as sand tailings fill areas. With the exception of one area, all the areas would be filled with sand tailings to within two feet of natural grade. The overburden spoil piles would then be graded over the fill to achieve an overburden cap averaging two feet in depth. North of Bowlegs Creek is an area scheduled for a low level fill with approximately five feet of sand tailings. After capping with overburden, the final surface elevation would be below natural grade but above the water table.

The overburden/clay waste disposal case would require an average dike height of 38 feet. The overburden sand/clay mix areas would be filled with a 25 percent mixture which equals 329.5 tons of dry clay per acre-foot of mix. The wastes disposed of in the mix areas would consolidate more rapidly than unmixed clay wastes deposited in conventional settling areas, but this fact would not reduce the height of the dikes required at the time of filling. The estimated power consumption for pumping waste sand and clay in this waste disposal case would be 2,444 x 10^6 kWh over the life of the mine.

2.5.4.2 Environmental Considerations

Environmental Advantages: This case would have the least amount of above-grade clay settling areas (2,847 acres). The average dike height would be reduced about one foot compared to the proposed conventional case. The active settling acreage and probability for a dike failure are about equal to that for the sand/clay mix case. Should a dike failure occur, the sand/clay mix material would not flow as quickly nor as far as the clay material. The sand/clay mix material would initially consolidate more rapidly than the clay material.

Environmental Disadvantages: The overburden/clay mix disposal case would generate the highest levels of fugitive dust, combustion emissions and noise levels of all cases. The power consumption for pumping waste sand and clay would be greatest of all the cases (144 percent greater than that required for the proposed conventional case). This method of disposal would require the greatest effort to recover phosphate reserves at a future date when advanced technology becomes available (0.16 ton of phosphate per ton of waste sand and clay). The overburden/clay mix case involves mining of overburden sand and sand/clay mix disposal, neither of which has been practiced in conjunction with phosphate mining. The risks of failure with the overburden/clay mix case, therefore, are greatest of all the cases.

2.5.5 SUMMARY COMPARISON

Table 2.5-11 presents comparative values for key areas of environmental evaluation. The conventional waste disposal case, while it is the least energy consumptive and the most proven technique, carries with it the problems and disadvantages traditionally associated with above-ground clay disposal, and an improved method involving the new technology of sand/clay mixing is in order. However, due to the limited quantity of sand available at the Mobil site for mixing with waste clay, the sand/clay mix technique could only be employed over a portion of the site. The sand/clay mix case would have to be a combination of sand/clay mix and conventional settling, resulting in only partial mitigation of the disadvantages of conventional settling. The overburden/clay mix case was formulated in an effort to supplement the limited sand resource. However, the energy requirements of the overburden/clay mix case are so high as to make this alternative infeasible, and the tremendous energy consumption is not offset by significant environmental gains.

The sand/clay cap plan was conceived as a means to take the fullest advantage of the limited sand resource and achieve most of the benefits of sand/clay mix

TABLE 2.5-11

SUMMARY OF WASTE DISPOSAL EVALUATION

Item	Conventional Clay Settling Case	Sand/Clay Cap Case	Sand/Clay Mix Case	Overburden/ Clay Mix Case
Average Dike Height of Above-Grade Basins (feet)	39	37	35	38
Area of Above-Grade Settling Basins, clay and sand/clay mix (acres)	8,170	8,170	8,339	8,339
Area of Above-Grade Clay Settling Basins, capped or uncapped (acres)	8,170	8,170	4,827	2,847
Area of Above-Grade Clay Settling Basins, without cap (acres)	6,681	0	1,642	0
Areas of Sand Tailings and Overburden Fill (acres)	5,511	5,511	4,760	4,760
Areas of Below-Grade Settling Basins (acres)	1,513	1,513	2,095	2,095
Phosphate Resources in Waste Disposal Areas, with clay (ratio of phosphate to waste material)	0.44	0.35	0.24	0.15
Groundwater Consumption (mgd)	16.4	16.4	16.2	16.4+
Dike Failure Risk Rating (4 = Highest Potential)	4	1	3	2
Energy Consumption for Pumping (10^6 kWh)	1,004	1,252	1,358	2,444
Technology Risks (number of processes or operations not proven)	0	1	1	2

SOURCE: STUDY DATA

(while eliminating conventional disadvantages) over the entire site. Briefly, the sand/clay cap case reduces dike heights, reduces the maximum acreage of active clay settling areas, and thus reduces the probability of dike failure. At the same time, it is relatively energy efficient, maintains the unrecovered phosphate resource in a form amenable to later extraction by improved technology, and employs largely proven technology so that its chances for successful application and anticipated results are high. In conclusion, the sand/clay cap waste disposal case is the environmentally preferred alternative.

2.6 RECLAMATION ALTERNATIVES

Reclamation plans are closely related to the waste disposal method employed in that the waste disposal plans determine the acreages for each reclaimed area and the final land use options. Reclamation goals following any type of waste disposal include returning the land to conditions as similar to premining as possible and with the least restrictions on future land uses.

2.6.1 CONVENTIONAL CLAY SETTLING PLAN (MOBIL'S PROPOSED ACTION)

2.6.1.1 General Description

During the course of mining, Mobil would disturb and reclaim 15,194 acres of the South Fort Meade Mine site. Of the 2,055 acres of wetlands on the site, 1,923 acres would be disturbed by mining. When reclamation is complete, the total wetland acreage would be approximately 93 percent of that existing on the site; the combined forested stream channel and wetland acreage would exceed the existing wetland acreage by approximately seven percent. The reclaimed site is also scheduled to have approximately 1,940 acres planted as upland hardwood and mixed forest. Reclaimed upland mixed forest would serve to expand the forested zone along the Peace River and Bowlegs Creek and provide densely forested stands. The acreage distribution of the various land use categories for both reclaimed and undisturbed land is shown in Table 2.1-1.

Figure 2.1-E shows the reclaimed areas on the site. Agriculture would be the predominant use of the reclaimed site, with more than a 49 percent increase in improved pasture acreage. Planted pine acreage, presently occupying 340 acres, would be harvested before mining begins. Planted pine reforestation (453 acres) would cover 34 percent more of the reclaimed site.

Reclamation of Landforms: The following summary shows the acreage totals for the proposed reclaimed landforms.

Reclaimed Landform	Reclaimed Acreage
Sand tailings fill areas with overburden cap	5,034*
Above-grade clay settling areas (uncapped)	6,681
Above-grade clay settling areas with sand cap	1,489
Below-grade clay settling areas	1,513
Overburden fill areas	308*
Miscellaneous backfill areas (clear water pool)	45
Disturbed natural ground (plant site and entrance railroad)	124
Total	15,194

* Includes setbacks from public roads and property boundaries which would be disturbed but not mined.

Sand Tailings Fill Areas: The 5,034 acres of sand tailings fill areas would be capped with overburden to an average depth of two feet in order to provide a reclaimed soil with favorable agronomic properties. The majority of the sand tailings fill areas would be initially reclaimed to improved pasture. Sand tailings fill areas TF-2 and TF-3 (Figure 2.5-B) are scheduled for pine plantings and would be the first large upland reclamation areas on the site.

Above-Grade Clay Fill Areas: The 6,681 acres of uncapped above-grade clay fill areas would have phosphatic clay both as the backfill material and the reclaimed surface soil. Soils such as these are best suited to perennial forage crops; therefore, improved pasture would be established on most of the above-grade clay fill areas. The development of improved pasture would control erosion and stabilize the reclaimed soils.

Above-Grade Clay Fill Areas Capped with Sand: The 1,489 acres of clay settling areas capped with sand would have sand tailings as the surface soil and clay as the subsurface fill. The thickness of the proposed sand cap would range from 8 to 10 feet. Some of the sand capped clay settling areas would be used as improved pasture as has been done in the past. Other areas would be reforested with a mixture of native tree species.

Below-Grade Clay Settling Areas: These areas are discussed under Reclamation of Stream Channels and Wetlands.

Overburden Fill Areas: The eight overburden fill areas (308 acres) would have overburden as both the backfill and surface soil material. These areas would be reclaimed to approximately natural grade and would have good structural stability and drainage properties. Since overburden soils have good structural stability, nutrient retention capacity and moisture holding capacity, the reclaimed overburden areas would constitute multipurpose land suitable for a variety of structural and agricultural uses similar to those of the present site.

Disturbed Natural Ground and Miscellaneous Backfill Areas: The reclaimed plant site area would include both natural ground and the clear water pool backfilled with overburden. As such, the area would have sufficient load bearing strength to permit unrestricted post-reclamation development. The natural and overburden surface soils would be capable of supporting agricultural uses such as improved pasture and silviculture. The initial plan is to reclaim this area as improved pasture.

Relamation of Stream Channels and Wetlands: The proposed plan provides for the reclamation of approximately 60,000 linear feet of stream channels and 1,780 acres of wetlands on the site. The reclaimed stream channels would replace the minor tributaries of the Peace River and Bowlegs Creek which would be disturbed by mining. Two types of wetlands included in the reclamation plan are below-grade clay fill areas and shallow depressions near the confluence of restored stream channels with natural drainage courses.

Stream Channel Reclamation: Included in the stream reclamation plans are the disturbed portions of Gilshey Branch, Gurr Run, Stephens Branch, Maron Run, Propps Branch and several unnamed tributaries to Bowlegs Creek. In addition, a stream channel would be reclaimed to drain the south central portion of the site south to Parker Branch.

All stream channel reclamation would be done in sand tailings fill or overburden fill areas. Stream channel reclamation plans provide for the creation of a normal water level channel and an associated floodplain. A gradall or small dragline would be used to excavate a channel in a meandering fashion through the reclamation areas. The floodplain for the reclaimed stream would be provided by grading the bank slopes to gentle gradients. In the sand tailings fill areas, the excavation and rough grading would be done in the sand fill prior to the deposition of the overburden cap. Final grading and sloping of the floodplain would be done during placement of the overburden cap.

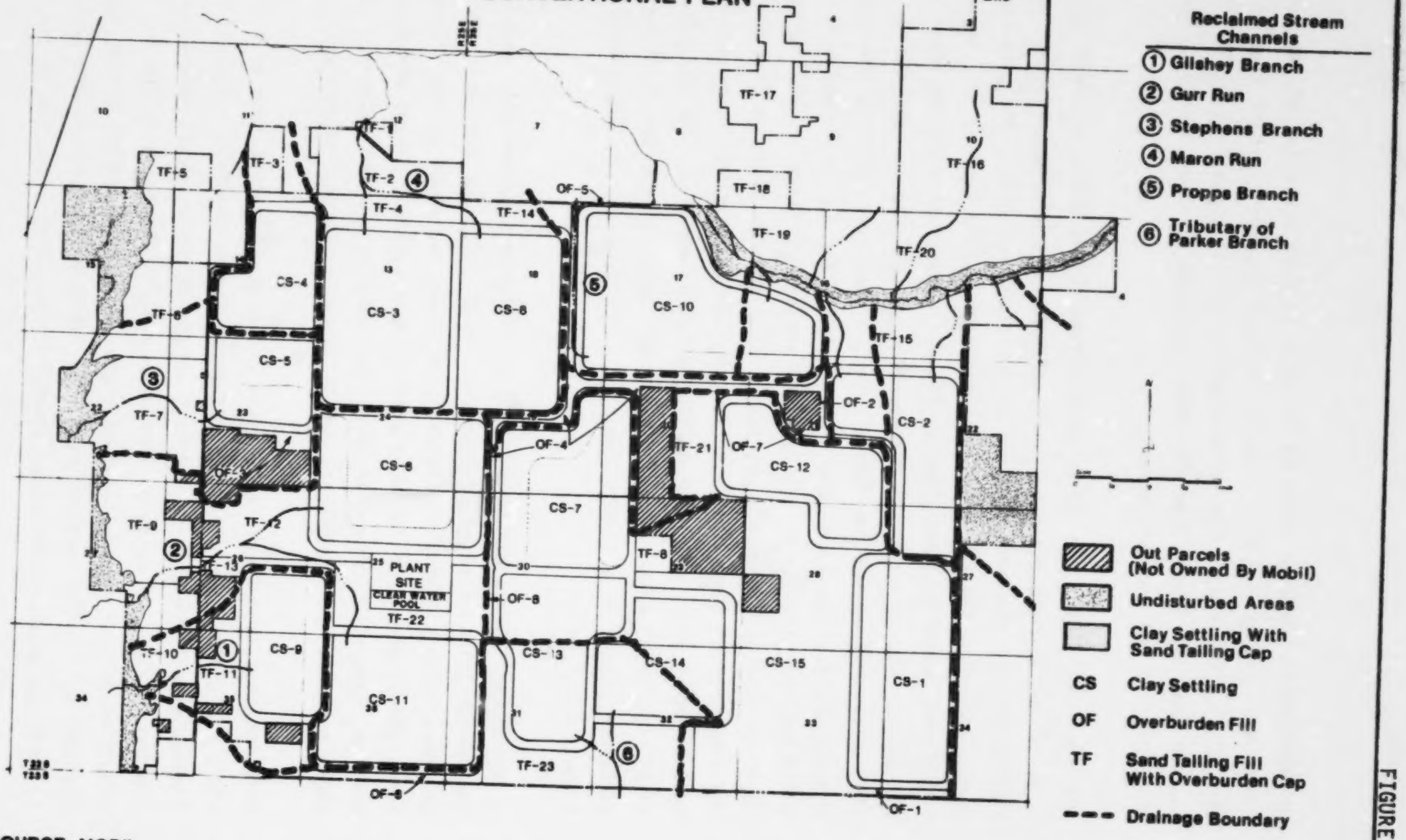
In all reclaimed stream channels, shallow pools would be excavated at intervals of approximately 500 feet along the length of the channels. These pools would be designed to have a bottom depth three feet below the reclaimed stream bed and would be about 100 feet in diameter. The inclusion of these shallow, permanent pools along the channels would serve as a water supply for wildlife and cattle.

Tentative locations and approximate drainage basins for the reclaimed stream channels planned for the site are shown in Figure 2.6-A. The exact location of the reclaimed stream channels would depend primarily on the internal drainage pattern in each reclaimed area. Although not in exactly the same location, the reclaimed channels would be in the same general vicinity as the existing streams. Where possible, the reclaimed streams would be designed to have approximately the same lengths and drainage basins as existing streams. Reclaimed elevations have been planned to provide gradients towards the major undisturbed drainage courses on the site. When reclamation is complete, the western and southwestern portions of the site would drain to the Peace River, the northern and northeastern portions to Bowlegs Creek, and the south central and southeastern portions to Parker Branch.

Below-Grade Clay Filled Areas: Below-grade clay filled areas (1,513 acres) would be designed specifically for wetland reclamation. All reclaimed wetlands would be positioned on the site to receive drainage from upland reclamation areas. Drainage outfalls and fill levels would be designed to provide areas of open water adjoined by seasonally flooded zones gradually sloping up to the graded spoil areas which would be inundated only at high water. When

PROPOSED LOCATIONS AND APPROXIMATE DRAINAGE BASINS FOR RECLAIMED STREAM CHANNELS

CONVENTIONAL PLAN


Reclaimed Stream Channels
① Gilshey Branch
② Gurr Run
③ Stephens Branch
④ Maron Run
⑤ Propps Branch
⑥ Tributary of Parker Branch
▨ Out Parcels (Not Owned By Mobil)
Undisturbed Areas
☐ Clay Settling With Sand Tailing Cap
CS Clay Settling
OF Overburden Fill
TF Sand Tailing Fill With Overburden Cap
Drainage Boundary
CS-1
CS-2
CS-3
CS-4
CS-5
CS-6
CS-7
CS-8
CS-9
CS-10
CS-11
CS-12
CS-13
CS-14
CS-15
TF-2
TF-3
TF-4
TF-5
TF-6
TF-7
TF-8
TF-9
TF-10
TF-11
TF-12
TF-13
TF-14
TF-15
TF-16
TF-17
TF-18
TF-19
TF-20
TF-21
TF-22
TF-23
OF-1
OF-2
OF-4
OF-5
OF-6
OF-7
OF-8
PLANT SITE
CLEAR WATER POOL

SOURCE: MOBIL

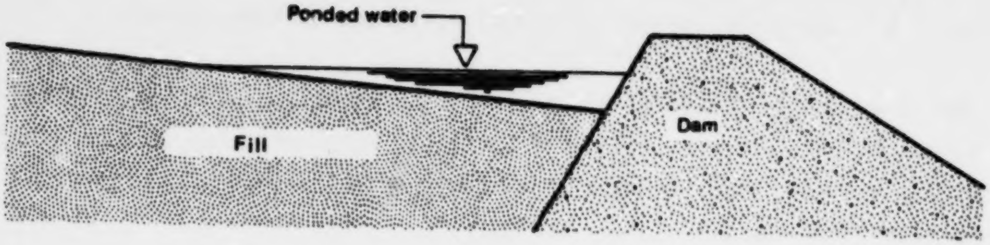
reclamation is complete, Area CS-14 would receive a portion of the drainage from CS-13 (Figure 2.5-B). Area CS-15 would receive drainage from CS-1, CS-7, CS-12, TF-8 and TF-21. The below-grade nature of these areas, the clay base, and the drainage inputs from the other reclamation areas should be sufficient to maintain a wetland environment.

Shallow Depressions: Thirteen shallow depressions would be constructed on 345 acres of marsh where drainage exits reclaimed waste disposal areas. These depressions are desirable for use as reclaimed wetlands. The dikes would be graded away from the areas to leave the depressions intact. The size of the ponded area would be controlled by the design elevation of the overflow drainage swale. The elevation of the overflow swale would be designed so that at high water, the ponded area would cover an area equivalent to three percent of the acreage represented in the drainage basin for the reclaimed wetland. In the immediate vicinity of the overflow swale, a gradall or small dragline would be used to deepen the depression to a minimum depth of four feet below the elevation of the swale. This excavation is intended to provide a permanent standing water component in the reclaimed wetland. The reclaimed wetland would consist of a small area of permanent water around the overflow drainage swale surrounded by a larger, gently sloping area that is seasonally flooded (Figure 2.6-B).

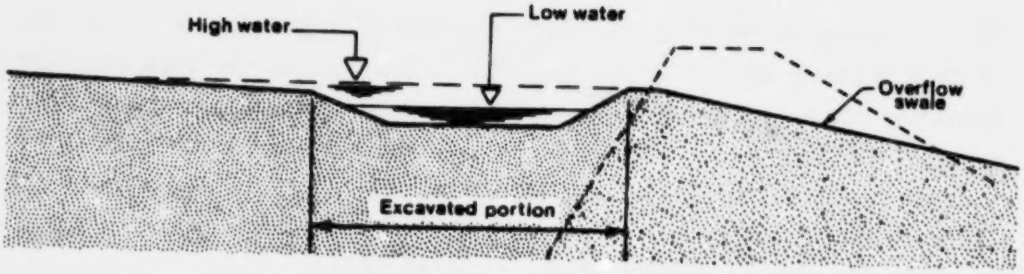
Revegetation: The conventional clay settling reclamation plan would provide for revegetation of all land disturbed by mining. The six basic revegetation programs in this plan are reforestation along reclaimed stream channels, wetland reforestation, nonforested wetland revegetation, upland mixed reforestation, commercial pine plantings, and improved pasture planting. Each of these programs is discussed in detail in the following subsections.

Reforestation Along Reclaimed Stream Channels: Reforestation of 277 acres would be accomplished along the reclaimed stream channels. Because of the limited experience with reforesting stream channels, Mobil initiated a reforestation feasibility study on Sink Branch near Fort Meade in the fall of 1979. A portion of Sink Branch had been disturbed by a phosphate mining operation in the 1950's. In the feasibility study, Mobil excavated a meandering channel (through an adjacent reclaimed area) for rerouting a section of the creek.

FORMATION OF SHALLOW DEPRESSIONS


Ponded water
Fill
Dam

During fill


High water
Low water
Overflow swale
Excavated portion

During reclamation

SOURCE: ZELLARS-WILLIAMS

NOTE: NOT TO SCALE

The new channel was then divided into four segments for the following soil treatment:

- o 1-foot layer of organic soil over overburden substrate
- o 0.5-foot layer of organic soil over overburden substrate
- o Overburden substrate plus fertilization as dictated by soil test
- o Overburden substrate alone, i.e., the control segment.

The three types of transplant stock used in the plantings were two-inch to four-inch native trees obtained from nearby Mobil property, potted native seedlings obtained from a commercial nursery, and bare-root native seedlings obtained from the Division of Forestry.

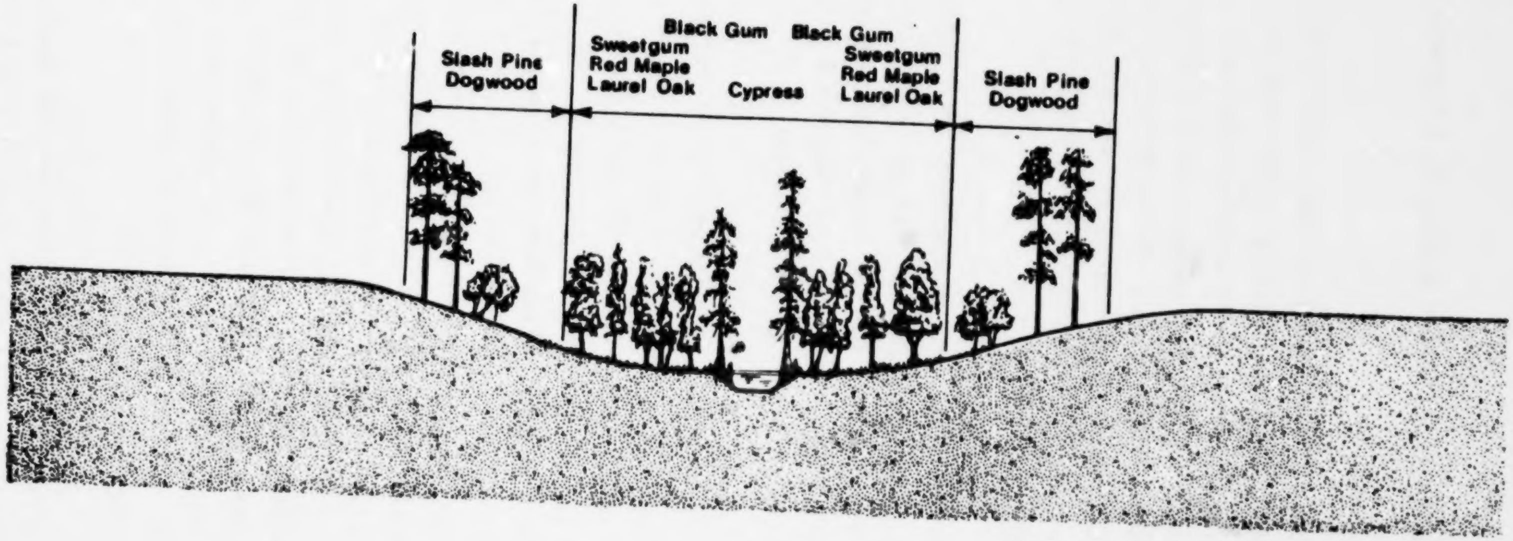
The reclamation area is being monitored by Mobil to assess the impact of diversion on water quality and the effect of soil treatment and transplant type on tree survival. Mobil plans to continue monitoring the Sink Branch reclamation area as well as the ongoing Division of Forestry research program on the reforestation of disturbed phosphate land. The results of these and other projects are expected to point the way to improved reforestation techniques for reclaimed phosphate land.

Mobil proposes to reforest the reclaimed stream channels in a manner similar to that followed at Sink Branch. Figure 2.6-C depicts the proposed plantings along the stream channels. Hydric species such as cypress and black gum would be planted along the margins of the reclaimed channel. Transition species such as sweetgum, red maple, and laurel oak would be planted in the reclaimed floodplain of the streams. Mesic species such as slash pine and dogwood would be planted along the margins of the forested areas.

Potted seedlings would be used as the primary transplant stock in the reforestation effort. This stock has exhibited good survival rates and offers the greatest flexibility in terms of planting dates and availability. Potted transplant stock would be supplemented with tree-spade and bare-root transplants when appropriate species are available in on-site areas that are to be mined. Approximately 10 foot by 10 foot spacings are planned for the reforestation areas. This results in a planting density of more than 400 trees per acre. If the survival rate falls below 50 percent after one growing season,

FIGURE 2.6-C

REFORESTATION OF RECLAIMED STREAM CHANNELS


Slash Pine
Dogwood
Black Gum
Sweetgum
Red Maple
Laurel Oak
Cypress
Black Gum
Sweetgum
Red Maple
Laurel Oak
Slash Pine
Dogwood

SOURCE: MOBIL

NOTE: NOT TO SCALE

additional plantings would bring the density to a minimum of 200 trees per acre.

Wetland Reforestation: The proposed wetland revegetation program for below-grade clay fill Area CS-14 is graphically represented in Figure 2.6-D. The 478 acres of graded spoil areas would be reforested with a variety of native tree species. Wetland species such as bald cypress, blackgum, and water ash would be the dominant plantings. A planting density of approximately 400 trees per acre is planned with both bare-root and potted seedlings as transplant stock. If necessary, the areas would be replanted to achieve a minimum stand density of 200 trees per acre.

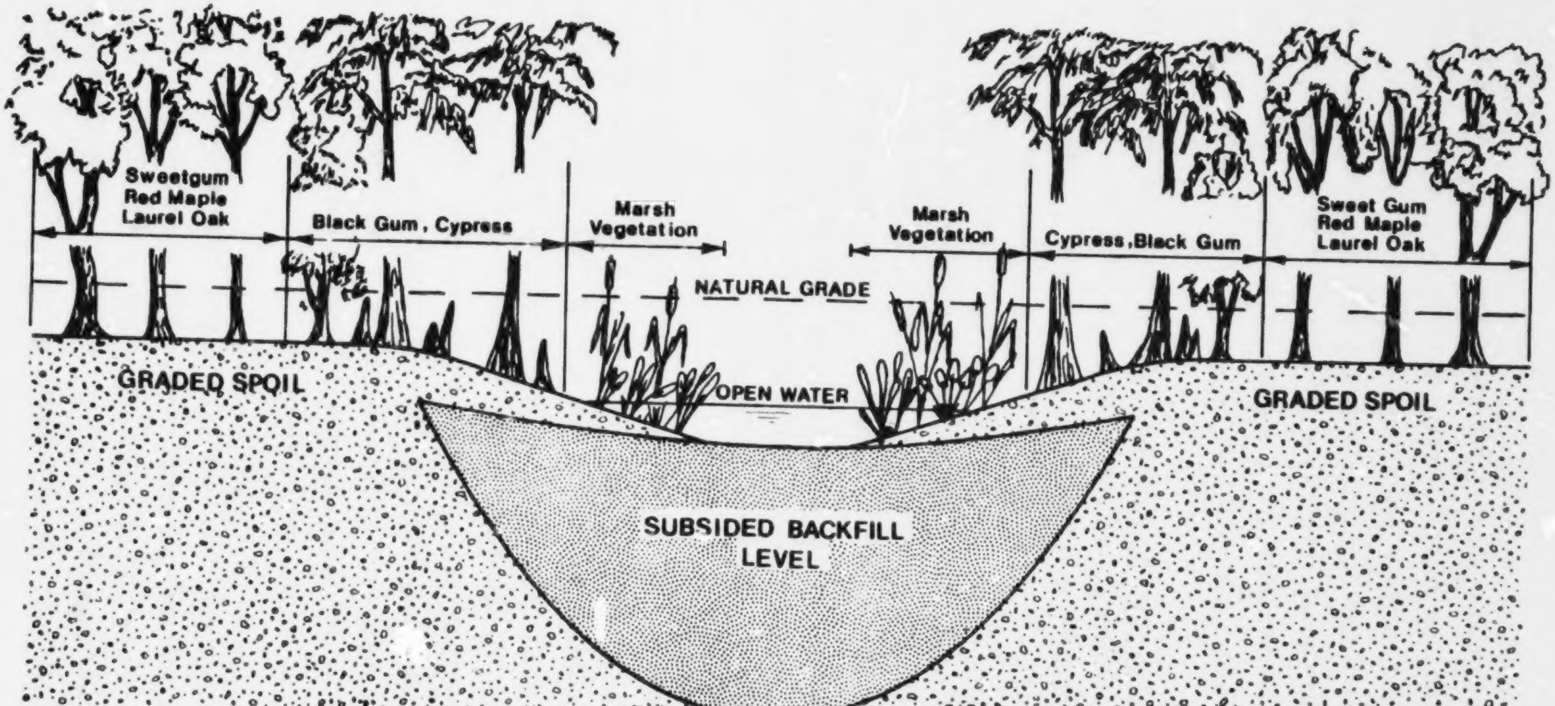
Nonforested Wetland Revegetation: Approximately 957 acres of marsh would be reclaimed in the below-grade clay fill area CS-14. An additional 354 acres of marsh would be provided by the shallow depressions created in above-grade clay fill areas. All reclaimed marshes would be adequately revegetated to enable them to perform their intended wetland functions.

As with wetland reforestation, the revegetation of reclaimed marshes is currently receiving heavy research emphasis by the phosphate industry. Approaches to marsh revegetation include the use of substrates from existing marshes as a seed and vegetative propagule source, the transplanting of the desired vegetation from existing marshes, and simply allowing wetland environments to revegetate naturally. Each approach has been successful in certain areas. Research may suggest more effective alternative approaches. In view of the rapid developments in this field, Mobil maintains that specifying detailed marsh revegetation plans for reclamation efforts that would take place more than ten years in the future is inappropriate. Mobil is required by state law to provide a 50 percent herbaceous cover on all nonforested wetlands. Mobil proposes that they submit specific marsh revegetation methods at the time that the reclamation plans for these areas are submitted to the state for approval. These specific methods would be based upon the best state-of-the-art technology then available.

Upland Mixed Reforestation: The reclamation plan would provide for reforestation of approximately 1,271 acres of upland with a mixture of native tree

FIGURE 2.6-D

REVEGETATION OF BELOW-GRADE CLAY RECLAMATION AREA


Sweetgum
Red Maple
Laurel Oak
Black Gum, Cypress
Marsh Vegetation
NATURAL GRADE
Marsh Vegetation
Cypress, Black Gum
Sweet Gum
Red Maple
Laurel Oak
GRADED SPOIL
OPEN WATER
GRADED SPOIL
SUBSIDED BACKFILL LEVEL

SOURCE: MOBIL

NOTE: NOT TO SCALE

species. Two general types of plantings would be included in the upland reforestation areas. One consists of reforestation plantings adjacent to undisturbed forested areas. The reclamation plan would provide for the reforestation of approximately 500-foot wide strips on reclaimed land adjacent to the undisturbed forested areas along the Peace River and Bowlegs Creek. The plan also provides for a 41-acre reforestation block adjacent to the forested area along the undisturbed lower portions of Maron Run.

The second type of upland mixed reforestation would be the planting of elongated strands approximately 200 feet wide in reclamation areas. These strands would provide reclaimed areas with densely forested strips to serve as cover and feeding grounds for wildlife, corridors for wildlife movement, aesthetic breaks in the landscape, and eventual shade areas for cattle. Whenever reclaimed soil conditions permit, the strands would be planted in a configuration that dissects reclamation areas. Because of the questionable structural ability of clay soils to support mature tree growth, reforestation strands in reclaimed clay fill areas would be planted along the graded remnants of the waste disposal dikes. Figure 2.1-E depicts the conceptual scheme for the upland mixed reforestation plantings.

A variety of native hardwood and coniferous trees would be included in the reforestation plantings. Species such as longleaf pine, live oak, and dogwood would be planted on the well-drained sites, while species such as water oak, laurel oak, sweetgum, and slash pine would be planted on the wetter sites. All these species are available either as potted seedlings from commercial nurseries or bare-root seedlings from the Division of Forestry. Mobil currently plans to use potted seedlings as the primary transplant stock for the hardwood species and bare-root seedlings as the transplant stock for pine species. When appropriate species are available nearby, tree-spade transplants would supplement the seedling transplant stock.

An average planting density of approximately 400 trees per acre is planned for the upland reforestation areas. This corresponds to an average spacing of about 10 feet by 10 feet, but not all reforestation plantings would be made at this regular spacing. At various intervals throughout the upland reforestation plantings, dense thickets would be planted to provide escape cover for wildlife and general diversity to the planting scheme. These thickets would average about an acre in size and would be planted generally in a single species at a density of about 1,000 trees per acre. All reforestation areas would be replanted as necessary to achieve an average density of 200 trees per acre after one growing season. The reforestation areas would be protected from grazing for a period of five years. During this period, additional natural reforestation of these areas would probably occur. Black cherry and sugarberry, whose seeds are dispersed by birds, are likely volunteer species in the strands and blocks that do not adjoin undisturbed forests. In the reforestation zones adjacent to the undisturbed forested areas, a more diverse volunteer tree growth is expected because of the proximity of the natural seed source.

Pine Plantings: Approximately 453 acres of planted pine reforestation would replace the 339 acres of existing pine plantations that would be mined. Pine plantings would be included in Areas TF-2 and TF-3. These areas are among the first large upland reclamation areas available on site. The pine plantations would be established using standard commercial reforestation techniques. During the winter dormant season, bare-root slash pine seedlings would be transplanted at a spacing of 8 feet by 8 feet for an initial planting density of approximately 680 trees per acre. If the pine plantings are successful in Areas TF-2 and TF-3, Mobil may amend its proposed revegetation plan to include more pine plantings in the latter stages of mine life.

Improved Pasture Planting: The reclamation plan would provide for improved pasture as the initial vegetative cover for approximately 11,413 acres of reclaimed land. Improved pasture would be established on portions of all upland reclaimed landforms (clay settling areas and sand tailings fill areas with overburden cap) and would be the dominant vegetative cover on the reclaimed site.

All improved pasture plantings would include both a grass and a legume component. Legumes, in combination with their bacterial symbiont, have the capacity to fix atmospheric nitrogen for utilization by higher plants. Therefore, the legume component would serve both as a forage complement to the grass and as a source of nitrogen to the sod. An effort would be made to select the best forage species for the particular landform and reclaimed surface soil type. Mobil proposes to select the particular grass and legume species to be used in revegetation at the time Mobil's reclamation programs for the particular areas are filed with the state. However, unless more promising species become available, Pensacola bahiagrass would be the principal grass used in the revegetation program. Legumes would be either interseeded with the grass or overseeded on established grass sods. All legume seed would be inoculated with the proper bacterial inoculant to ensure the capacity to fix atmospheric nitrogen. Prior to all forage plantings, fertilizer and lime would be applied according to soil test results. The need for lime is unlikely on most reclaimed soils in view of the high pH and calcium and magnesium levels reported for the reclaimed soil materials. All improved pasture areas would be protected from grazing until the forage plantings are firmly established.

Annual Reclamation Schedule: Table 2.6-1 summarizes the proposed annual reclamation schedule for the South Fort Meade Mine. In preparing this schedule, a total of three years after final fill is allotted to complete reclamation of sand tailings and overburden fills. Of this total, two years would be utilized in grading the areas to approved slopes, establishing drainage and planting vegetative cover. The third year is allotted for the vegetative cover to become established.

After final fill, seven years have been allotted to complete reclamation of uncapped clay settling areas. Of this total, three years are projected to be required for the areas to consolidate to 20 percent solids; three years to grade, establish drainage and plant a vegetative cover; and one additional year to allow the vegetative cover to become established.

Two years have been allotted after placement of the sand cap to complete reclamation of capped clay settling areas. One year is required to grade the fill and retaining dikes to approved slopes and to plant the vegetative cover; the remaining year is required for the vegetative cover to become established. Because the mined areas would be used for waste disposal, reclamation lags several years behind the mining schedule. Reclamation activities initially proceed at a slower rate than mining activities; however, reclamation proceeds rapidly for the last one-third of mine life and out-paces the rate of disturbance.

TABLE 2.6-1

ANNUAL RECLAMATION SCHEDULE
(Conventional Plan)

Year	Areas Reclaimed	Acreage Reclaimed During Year	Reclaimed Acreage Cumulative Total
1			
2	OF-1	25	25
3			
4	OF-2	32	57
5			
6			
7			
8	TF-1	20	77
9	TF-2, CS-1, TF-3	1,064	1,141
10	OF-3	32	1,173
11	TF-4, CS-2	671	1,844
12	TF-5	135	1,979
13	OF-4, TF-6	293	2,272
14	TF-8	40	2,312
15	TF-7, CS-3	1,155	3,467
16	TF-9	286	3,753
17	OF-5, TF-10	390	4,143
18	TF-11	135	4,278
19	TF-12, OF-6, TF-13, TF-14	389	4,667
20	TF-15	365	5,032
21	OF-7, TF-16, TF-17	1,007	6,039
22	OF-8, TF-18, TF-19, TF-20	704	6,743
23	TF-21, CS-4, CS-5, CS-8, CS-9	1,825	8,568
24	TF-22	230	8,798
25	CS-6, CS-10	1,770	10,568
26	CS-7	735	11,303
27	CS-11	690	11,993
28	CS-12	520	12,513
29	TF-23, Plant Site, RR, and CWP	578	13,091
30	CS-13	590	13,681
31			
32			
33	CS-14	520	14,201
34	CS-15	993	15,194

SOURCE: MOBIL

2.6.1.2 Environmental Considerations

Environmental Advantages: The conventional method of reclamation has been thoroughly utilized and tested by the industry over the years so that this plan is operationally the most proven.

Environmental Disadvantages: With the conventional plan, post-reclamation elevations and topography would be most altered from those existing since reclaimed landforms would extend the highest (45 feet) of the four relevant cases above the existing grade. The conventional reclamation case would involve the greatest alteration to existing surface water drainage patterns since the Parker Branch basin would be increased by 691 acres. The amount of reclaimed wetland acreage would be the least of the four cases, as would the amount of reclaimed upland mixed forest acreage. The conventional plan would have the largest area (6,681 acres) of above-grade clay settling without any cap and thus with waste clays as the surface soil. The exposed clay settling areas would have the highest post reclamation levels of soil radioactivity (22 pCi/g of radium-226) of all reclaimed landforms. Clay settling areas require a five to seven year period of crusting and the crust that forms is hard and difficult to till and tends to become water-logged. These areas would also have poor structural stability in both the short term and the long term. The clay disposal areas would block and divert groundwater in the regional Surficial Aquifer which would result in an altered flow of water through the Surficial Aquifer compared to premining conditions. Recharge to the artesian aquifer from the mine site would be reduced the greatest of all the plans.

2.6.2 SAND/CLAY CAP PLAN

2.6.2.1 General Description

The sand/clay cap plan, like the conventional plan would also involve the disturbance and reclamation of 15,194 acres of the South Fort Meade Mine site. Of the 2,055 acres of wetlands on the site, 1,923 acres would be disturbed by mining. When reclamation is complete the total wetland acreage (1,925 acres) would be approximately 93 percent of the existing acreage. The combined forested stream channel and wetland acreage would exceed the existing acreage in those categories by 14 percent.

The reclaimed site is scheduled to have approximately 1,451 acres of upland mixed forest, which would serve to expand the forested zone along the Peace River and Bowlegs Creek and provide densely forested strands. The acreage distribution of the various land use categories for both reclaimed and undisturbed land is shown in Table 2.6-2. Figure 2.6-E shows the post-reclamation land uses for the sand/clay cap plan.

Agriculture would be the predominant post-reclamation land use, with a 43 percent increase in improved pasture acreage. There would be a 57 percent increase in planted pine acreage (from 340 acres to 536 acres).

Reclamation of Landforms: The following summary shows the acreage totals for the proposed reclaimed landforms.

Reclaimed Landform	Reclaimed Acreage
Sand tailings fill areas with overburden cap	5,079*
Above-grade clay settling areas with sand/clay mix (4:1) cap	7,580
Above-grade clay settling area with overburden cap	590
Below-grade clay settling area with partial overburden cap	1,513
Overburden fill areas	308
Disturbed natural ground (plant site and entrance railroad)	124
Total	15,194

* Total acreage includes setbacks from public roads and property boundaries which will be disturbed but not mined.

Sand Tailings Fill Areas: These areas (5,079 acres) would be filled with sand tailings and then capped with overburden to an average depth of two feet to bring the reclaimed surface to approximately natural grade. Although most would be reclaimed to pasture, area TF-2, one of the first large upland reclamation areas on the site, would be used for pine plantings.

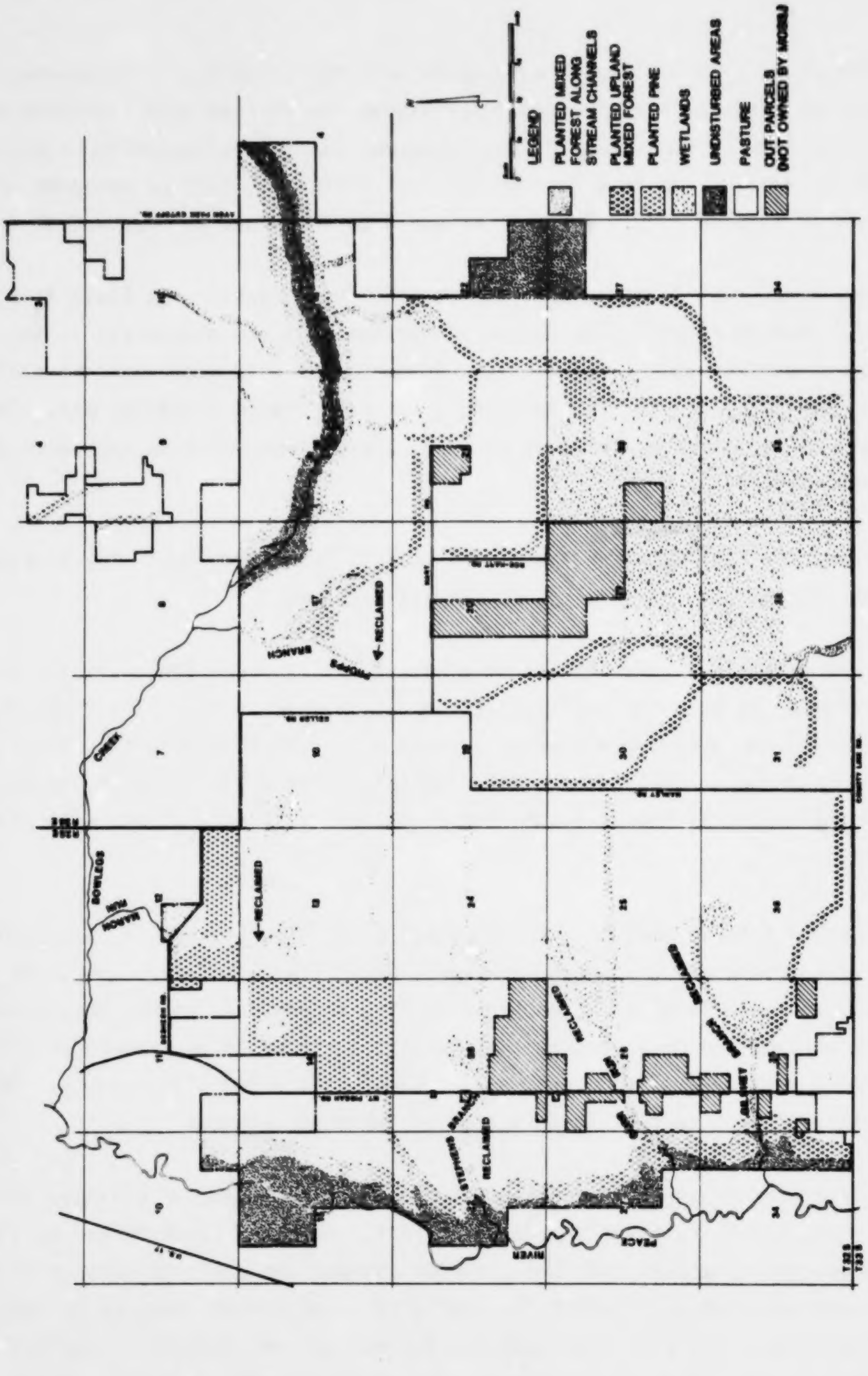
TABLE 2.6-2

LAND USE CATEGORIES
(Sand/Clay Cap Plan)

	Reclaimed Acreage	Undisturbed Acreage	Total
Improved Pasture	11,003	108	11,111
Cutover Flatwoods	0	182	182
Upland Hardwood Forest	0	664	664
Upland Mixed Forest	1,451	5	1,456
Planted Pine	536	0	536
Water Areas	0	3	3
Forested Stream Channels	279	0	279
Freshwater Swamp	504	111	615
Freshwater Marsh	1,421	21	1,442
TOTAL	15,194	1,094	16,288

SOURCE: ZELLARS-WILLIAMS

POST RECLAMATION LAND USE – SAND/CLAY CAP


LEGEND
PLANTED MIXED FOREST ALONG STREAM CHANNELS
PLANTED UPLAND MIXED FOREST
PLANTED PINE
WETLANDS
UNDISTURBED AREAS
PASTURE
OUT PARCELS (NOT OWNED BY MOBIL)
RECLAIMED
BOWLEGS CREEK
BRANCH
STEPHENS BRANCH
PEACE RIVER
COUNTY LINE RD.
U.S. 17

SOURCE: ZELLARS-WILLIAMS

Above-Grade Clay Settling Areas Capped with Sand/Clay Mix: Above-grade clay settling areas capped with sand/clay mix as the surface soil represent the largest area (7,580 acres) of any reclaimed landform proposed for the site. The cap would range from four to six feet thick and would be composed of a 4:1 ratio of sand to clay. These areas would be reclaimed as improved pasture.

Above-Grade Clay Settling Area Capped with Overburden: Area CS-13 (590 acres) would have phosphatic clay as the subsurface fill and overburden as the reclaimed surface soil. The land use potential of this area would be similar, but not identical, to clay settling areas capped with sand/clay mix. The area would be reclaimed as improved pasture. These areas would be reclaimed as improved pasture.

Below-Grade Clay Settling Areas with Partial Overburden Cap: See discussion under Reclamation of Stream Channels and Wetlands.

Overburden Fill Areas: The eight overburden fill areas (308 acres) would have overburden as both the backfill and surface soil material. The areas would be reclaimed to approximately natural grade and would have good structural stability and drainage properties. Reclaimed overburden areas would constitute multipurpose land suitable for a variety of structural and agricultural uses.

Disturbed Natural Ground: The reclaimed plant site area would include both natural ground and the clear water pool backfilled with overburden. As such, the area would have sufficient load bearing strength to permit unrestricted post-reclamation development. The natural soils would be capable of supporting agricultural uses such as improved pasture and silviculture. The initial plan is to reclaim this area as improved pasture.

Reclamation of Stream Channels and Wetlands: The two major drainage courses on site, the Peace River and Bowlegs Creek, would not be disturbed by the mining operation, and as with the proposed action, the drainage pattern to these streams would be restored by reclaiming forested stream channels to serve as tributaries. The plan also provides for wetland reclamation in shallow depressions in above-grade reclamation areas and below-grade clay fill areas.

Stream Channels: The 60,000 linear feet of reclaimed stream channels would replace disturbed portions of Gilshey Branch, Gurr Run, Stephens Branch, Maron Run, Propps Branch and several unnamed tributaries to Bowlegs Creek (Figure 2.6-F). In addition, a stream channel would be reclaimed to drain the south central portion of the site south to Parker Branch. The exact location of the stream channels would depend primarily on the internal drainage pattern in each reclaimed area. Although not in exactly the same location, the reclaimed streams would be in the same general vicinity as the existing streams and would tie in with undisturbed downstream portions. Where possible, the reclaimed streams would be designed to have approximately the same lengths and drainage basins as the existing streams.

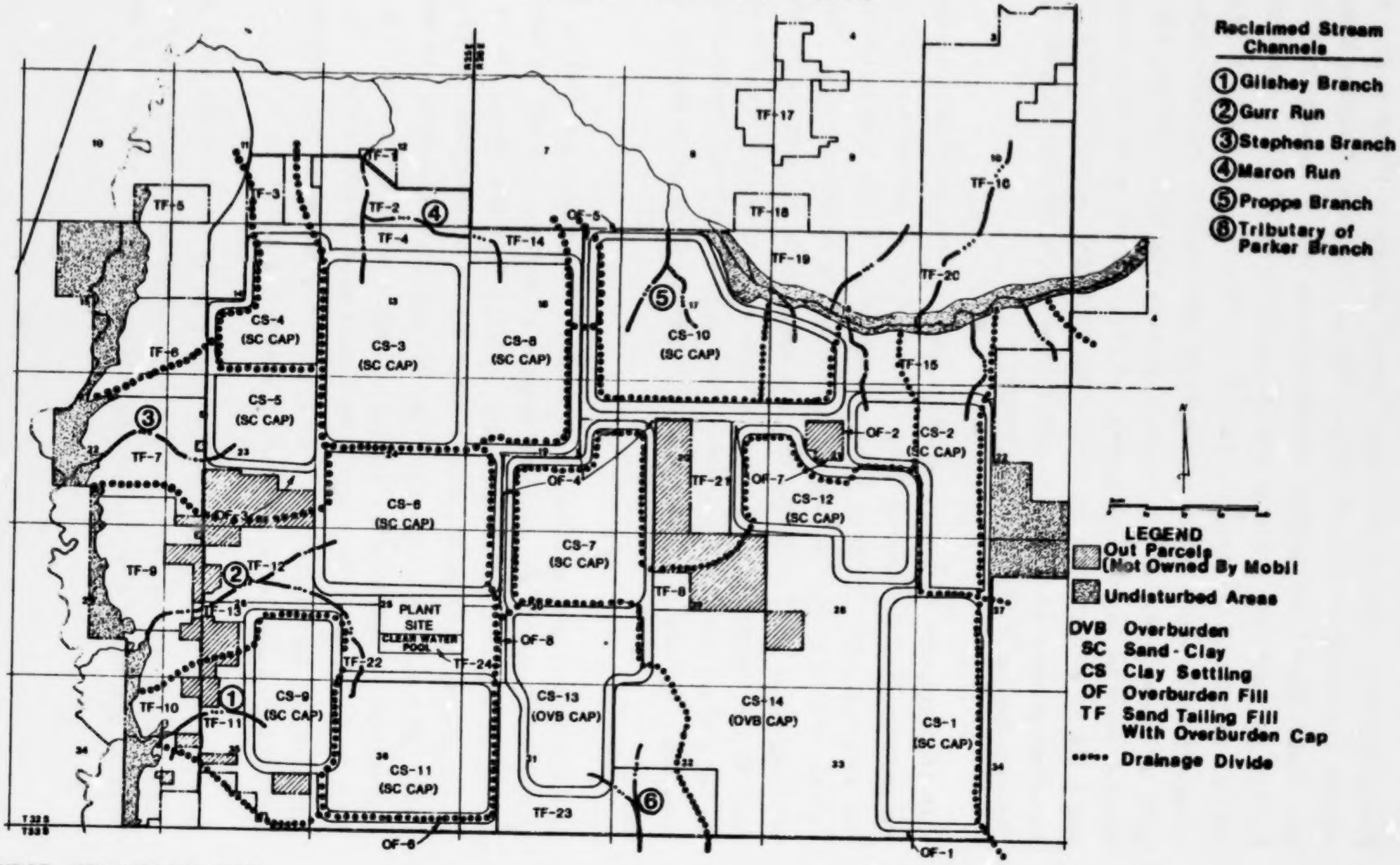
With the exception of the reclaimed channel for Propps Branch, stream channel reclamation would be done in sand tailings fill or overburden fill areas. In the sand tailings fill areas, the excavation and rough grading would be done in the sand fill prior to the deposition of the overburden cap. Final grading and sloping of the floodplain in these areas would be done during the placement of the overburden cap. In the reclamation of Propps Branch (Area CS-10) the excavation and grading would be done during the final reclamation of the area when the surface sand/clay mix has consolidated to 30 percent clay solids.

Shallow Depressions in Above-Grade Areas: The above-grade shallow depressions (in CS-1 through CS 13) would be created at drainage outlets to serve primarily as wetlands collecting water draining from the areas. In CS-1 through CS-12, the depressions would be created during placement of the sand/clay mix cap. The thickness of the sand/clay mix cap would determine the depth of the depressions. Consequently, depression depths would range from four to six feet in the 12 areas that are to be capped with sand/clay mix. The water level in the depressions would be established by the outfall elevation of the overflow drainage swale as shown in Figure 2.6-B.

In CS-13, the above-grade settling area that is to be capped with overburden ratner than sand/clay mix, the wetland depression would be created by controlled grading of the dike during reclamation. The site of the depression

PROPOSED LOCATIONS AND APPROXIMATE DRAINAGE BASINS FOR RECLAIMED STREAM CHANNELS

(SAND/CLAY CAP PLAN)


Reclaimed Stream Channels
① Gilshey Branch
② Gurr Run
③ Stephens Branch
④ Maron Run
⑤ Proppe Branch
⑥ Tributary of Parker Branch
LEGEND
Out Parcels (Not Owned By Mobil
Undisturbed Areas
OVB Overburden
SC Sand-Clay
CS Clay Settling
OF Overburden Fill
TF Sand Tailing Fill With Overburden Cap
Drainage Divide
CS-1 (SC CAP)
CS-2 (SC CAP)
CS-3 (SC CAP)
CS-4 (SC CAP)
CS-5 (SC CAP)
CS-6 (SC CAP)
CS-7 (SC CAP)
CS-8 (SC CAP)
CS-9 (SC CAP)
CS-10 (SC CAP)
CS-11 (SC CAP)
CS-12 (SC CAP)
CS-13 (OVB CAP)
CS-14 (OVB CAP)
PLANT SITE
CLEAR WATER POOL
TF-1
TF-2
TF-3
TF-4
TF-5
TF-6
TF-7
TF-8
TF-9
TF-10
TF-11
TF-12
TF-13
TF-14
TF-15
TF-16
TF-17
TF-18
TF-19
TF-20
TF-21
TF-22
TF-23
TF-24
OF-1
OF-2
OF-3
OF-4
OF-5
OF-6
OF-7
OF-8
T32S
T33S

SOURCE: ZELLARS-WILLIAMS

would be selected to coincide with an outlet spillway location, where an accumulation of fine particles generally results in greater subsidence and the formation of shallow, gently sloping depressions. During reclamations of CS-13, the dikes would be graded away from the selected wetland area to leave the depression intact. The size of the ponded water area would be determined by the design elevation of the overflow drainage swale. As with the other wetland depressions, the ponded area should cover approximately five percent of the total area of CS-13 at high water level.

Below-Grade Clay Fill Area with Partial Overburden Cap: The filling level of Area CS-14 has been planned to permit reclamation of the entire area (1,513 acres) as a wetland. The original clay fill level in the area would average approximately three feet below existing grade. Following clay deposition, surface water should be drawn off to promote subsidence and consolidation of the clay fill in the interspoil depressions. The protruding spoil piles would then be graded into the depressions so that the entire area would be below grade at reclamation. The grading would also result in the partial capping of the consolidated clay fill.

In addition to its below-grade elevation, the area would be located down gradient from other reclamation areas which would serve as a drainage basin for the wetland. When reclamation is complete, Area CS-14 would receive all the surface drainage from Areas CS-1, CS-12 and TF-8, as well as a portion of the drainage from Areas CS-13, TF-23 and the outparcels adjacent to the northwest portion of the area.

In order to maintain a wetland environment over the entire area, it would be necessary to establish a series of water levels within the area and to step down these levels by a series of overflow drainage swales. According to this plan, the area would be divided into four segments, with water levels held at 135 foot, 130 foot, 125 foot and 120 foot mean sea level (MSL) elevations by controlled grading of overburden spoils. The water levels would be set along the approximate original contour lines for the particular elevation so that the reclaimed water levels would be at or below the premining grade elevations for the area. The subdivisions would be connected by means of overflow drainage swales.

Revegetation: The revegetation strategy for the sand/clay cap reclamation plan would comprise the same six revegetation programs as the conventional plan: reforestation along reclaimed stream channels, wetland reforestation, nonforested wetland revegetation, upland mixed reforestation, commercial pine planting and improved pasture plantings. The post-reclamation land uses with the sand/clay cap plan are shown in Figure 2.6-E. The differences between the sand/clay cap revegetation program and that proposed in the conventional plan are the areal extent of each of the six types of revegetation programs, and differences in some of the plant species used in these programs due to the differences in soil characteristics.

Reforestation Along Reclaimed Stream Channels: Approximately 279 acres of reforestation would be developed along the reclaimed stream channels. These stream channels would be reforested in a manner similar to that followed at Sink Branch (see Section 2.6.1.1). Revegetation would be completed prior to opening the channels to avoid erosion and turbidity problems. As discussed in the conventional plan, hydric species such as cypress and black gum would be planted along the margins of the reclaimed channels. Transition species such as sweetgum, red maple, and laurel oak would be planted in the reclaimed floodplain of the streams. Mesic species such as slash pine and dogwood would be planted along the margins of the forested areas.

Wetland Reforestation: The reforestation of wetlands would be performed on 504 acres of graded spoils which occur in the below-grade fill areas of CS-14. These areas would be reforested with a variety of native tree species composed primarily of bald cypress, blackgum and water ash. The planting would be conducted in the same manner discussed in the proposed action.

Nonforested Wetlands Revegetation: Approximately 1,009 acres of freshwater marsh would be reclaimed in the below-grade clay fill areas (CS-14). An additional 412 acres of marsh would be provided by the shallow depressions created in above-grade clay fill areas. All reclaimed marshes would be adequately revegetated to enable them to perform their intended wetland functions. The revegetation program for these wetlands would be conducted in the same manner as the proposed action discussed in Section 2.6.1.1.

Upland Mixed Reforestation: The reclamation plan would provide for reforestation of approximately 1,451 acres of upland with a mixture of native species. The upland reforestation plan would consist of two types of plantings. The first consists of reforestation plantings adjacent to undisturbed forested areas. The reclamation plan provides for the reforestation of approximately 500-foot wide strips on reclaimed land adjacent to the undisturbed forested areas along the Peace River and Bowlegs Creek. The plan also provides for a 41-acre reforestation block adjacent to the forested area along the undisturbed lower portions of Maron Run. The second type of upland mixed reforestation is the planting of elongated strands approximately 200 feet wide in the reclamation areas. These areas would serve the same functions described in the proposed action and the planting would be conducted in the same manner discussed under the proposed action. In addition, at the junction of various strands, the planting zone would be expanded to form reforestation blocks. Figure 2.6-E depicts the conceptual scheme for the upland mixed reforestation under the sand/clay cap plan.

Pine Plantings: Approximately 536 acres of pine plantings would replace the 339 acres of existing pine plantations to be mined. Pine plantings are scheduled for areas TF-2 and CS-4, the first large upland reclamation areas available on site. Pine plantings on overburden soils such as that of area TF-2 have produced good results; however, there is no previous experience with pine plantings on sand/clay soils. The silvicultural potential of these soils would be evaluated by comparing area CS-4 with the planting in area TF-2. The establishment of the pine plantings would be the same as described in the proposed action (see Section 2.6.1.1). If the pine plantings prove to be successful on the sand/clay soils, the revegetation plan may later be amended by Mobil to include more pine plantings in the latter stages of mine life.

Improved Pasture Plantings: The reclamation plan would provide for improved pasture as the initial vegetative cover for approximately 11,003 acres of reclaimed land. Improved pasture would be established on portions of all upland reclaimed landforms and would be the dominant vegetative cover on the reclaimed site.

Improved pasture would be established in the same manner described in the proposed action except that the selection of particular grass and legume species would include additional alternatives which are found to grow favorably in some of the sand/clay soils. In addition to the Pensacola bahiagrass, discussed in the proposed action, Coastal and Callie bermudagrass varieties which do well on well-drained reclaimed soils may also be used. These grasses produce high yields of excellent quality forage under optimum conditions, but are more selective in their soil requirements and require a higher level of management. The bermudagrass varieties may be utilized as the grass component on sand/clay and overburden soil which have good surface drainage.

Annual Reclamation Schedule: Table 2.6-3 displays the proposed annual reclamation schedule for the sand/clay cap waste disposal method. In preparing this schedule, a total of three years after final fill has been allotted to complete reclamation of sand tailings and overburden landfills. Of this total, two years would be utilized in grading the areas to approved slopes, establishing drainage, and planting a vegetative cover. The third year is allotted for the vegetative cover to become established.

A total of five years after final fill has been allotted to complete the reclamation of clay settling areas capped with sand/clay mix. Two years would be allowed for the material to consolidate to approximately 30 percent clay solids. The next two years would be used to grade the areas to approved slopes, establish drainage, and plant the vegetative cover. The final year is required to allow the vegetative cover to become established.

After final fill, seven years have been allotted to complete reclamation of the clay settling areas that are to be capped with overburden. Of this total, three years are projected to be required for the areas to consolidate to 22 percent clay solids; three years to grade, establish the drainage pattern, and plant the vegetative cover; and one additional year to allow the vegetative cover to become established. Because the mined areas would be used for waste disposal and the planned stage fill of the clay settling areas with a sand/clay mix cap, reclamation lags several years behind the mining schedule. By the time the early waste disposal areas are deactivated, reclamation proceeds

TABLE 2.6-3

ANNUAL RECLAMATION SCHEDULE
(Sand/Clay Cap Plan)

Year	Areas Reclaimed	Acreage Reclaimed During Year	Reclaimed Acreage Cumulative Total
1			
2	OF-1		
3		25	25
4	OF-2		
5		32	57
6			
7			
8	TF-1		
9	TF-2, TF-3	20	77
10		284	361
11	OF-3, TF-4		
12	TF-5	163	524
13		135	659
14	OF-4, TF-6, CS-1, TF-8		
15	TF-7, CS-2	1,113	1,772
16	TF-9	855	2,627
17	TF-10	286	2,913
18	OF-5, TF-11, CS-4	300	3,213
19	TF-12, TF-13, TF-14	610	3,823
20	OF-6, TF-15, CS-5	332	4,155
21	TF-16	722	4,877
22	OF-7, TF-17, TF-18, TF-19	760	5,637
23	OF-8, TF-20, TF-21, CS-6	474	6,111
24	TF-22, CS-7	1,347	7,458
25	CS-8	965	8,423
26		620	9,043
27	CS-9		
28		400	9,443
29	TF-23, TF-24, CS-10 Plant Site, RR		
30	CS-11	1,598	11,041
31	CS-12	690	11,731
32	CS-3	520	12,251
33		840	13,091
34	CS-13,CS-14	2,103	15,194

SOURCE: ZELLARS-WILLIAMS

rapidly and out-paces the rate of disturbance for the last part of the mine life.

2.6.2.2 Environmental Considerations

Environmental Advantages: Placement of a sand/clay or overburden cap over all uncovered clay settling areas would provide the greatest agronomic potential of all the alternatives. The stuctural stability (short and long-term) would be the best of all the alternatives. The average soil radium levels would be the least of all the alternatives (equal to overburden/clay mix). The radon-226 concentration of the surface soil would be half the level associated with the uncapped clay settling areas. The sand/clay cap reclamation plan would alter drainage areas slightly less than the conventional clay settling plan since 571 additional acres would drain to Parker Branch as compared to 691 acres.

Environmental Disadvantages: Sand/clay cap reclamation techniques at the present time have not been fully tried and proven. The potential reduction in recharge is essentially the same as the conventional clay settling plan.

2.6.3 SAND/CLAY MIX PLAN

2.6.3.1 General Description

The sand/clay mix plan would involve the disturbance and reclamation of 15,194 acres of the South Fort Meade Mine site. The sand/clay mix reclamation plan would provide 2,255 acres of wetlands, an increase of 9.7 percent over the existing site. The combined forested stream and wetland acreage would exceed the existing wetland acreage in those categories by 34 percent. The reclaimed site is scheduled to have approximately 1,831 acres of upland mixed forest. The acreage distribution of the various land use categories for both reclaimed and undisturbed land is shown in Table 2.6-4. The drainage pattern to the Peace River and Bowlegs Creek would be restored by reclaiming approximately 60,000 linear feet of stream channel to serve as tributaries. Agriculture would be the predominant post-reclamation land use, with a 52 percent increase in improved pasture acreage. There would be a 27 percent increase in planted pine acreage (from 339 acres to 431 acres).

TABLE 2.6-4

LAND USE CATEGORIES
(Sand/Clay Mix Plan)

	Reclaimed Acreage	Undisturbed Acreage	Total
Improved Pasture	10,313	108	10,421
Cutover Flatwoods	0	182	182
Upland Hardwood Forest	0	664	664
Upland Mixed Forest	1,826	5	1,831
Planted Pine	431	0	431
Water Areas	0	3	3
Forested Stream Channels	263	0	263
Freshwater Swamp	746	111	857
Freshwater Marsh	1,615	21	1,636
TOTAL	15,194	1,094	16,288

SOURCE: ZELLARS-WILLIAMS

Reclamation of Landforms

The following summary shows the acreage totals for the proposed reclaimed landforms. Figure 2.6-G shows the post-reclamation land uses for the sand/clay mix plan.

Reclaimed Landform	Reclaimed Acrage
Sand tailings fill areas	3,020*
Above-grade sand/clay mix areas	3,352
Below-grade sand/clay mix areas	160
Above-grade clay filled areas capped with sand/clay mix	3,185
Above-grade clay filled areas	1,642
Below-grade clay filled areas	2,095
Overburden fill areas	733*
Graded spoil areas	838
Miscellaneous backfill (clear water pond)	45
Disturbed natural ground (plant site and entrance railroad)	124
Total	15,194

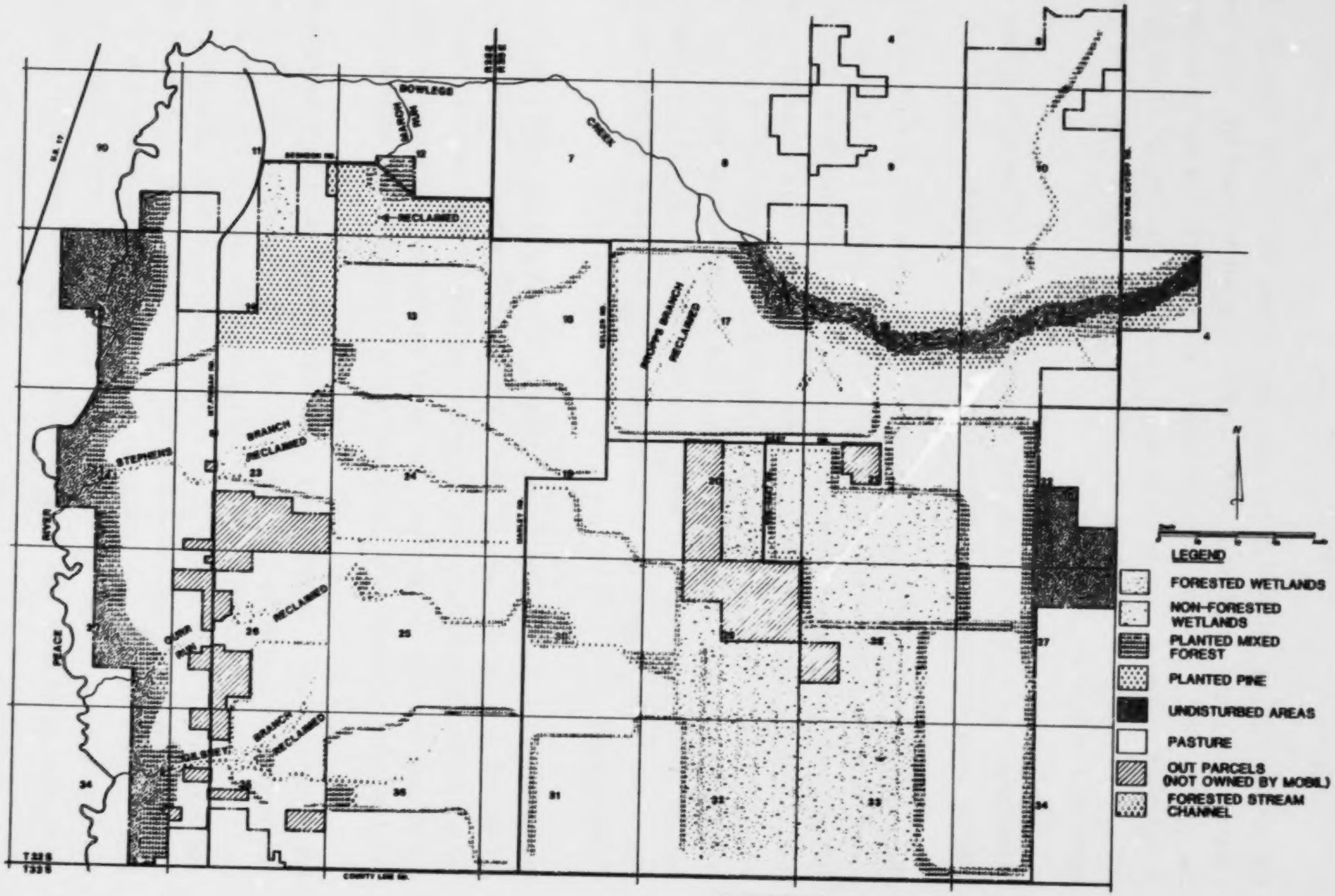
*Total acreage includes setbacks from public roads and property boundaries which will be disturbed but not mined.

Sand Tailings Fill Areas: These areas (3,020 acres) would be filled to near natural grade with sand tailings and then capped with overburden to an average depth of two feet, bringing the reclaimed surface to approximately natural grade. Area TF-9 would have a low level tailings fill followed by an overburden cap. The majority of the tailings fill areas would be reclaimed as pasture.

Above-Grade Sand/Clay Mix Areas and Above-Grade Clay Fill Areas Capped with Sand/Clay Mix: Above-grade areas with sand/clay mix in the surface soil represent the largest acreage (6,537 acres) of any reclaimed landform proposed for the site. Of the 18 areas in this category, six would have clay alone as the

FIGURE 2.6-G

POST RECLAMATION LAND USE - SAND/CLAY MIX


BOWLEGS CREEK
HORSE CREEK
PEACE RIVER
STEPHENS BRANCH RECLAIMED
PHOSPHATE BRANCH RECLAIMED
RECLAIMED
COUNTY LINE RD.
N
LEGEND
FORESTED WETLANDS
NON-FORESTED WETLANDS
PLANTED MIXED FOREST
PLANTED PINE
UNDISTURBED AREAS
PASTURE
OUT PARCELS (NOT OWNED BY MOBIL)
FORESTED STREAM CHANNEL

SOURCE: ZELLARS-WILLIAMS

Reproduced from best available copy.

subsurface fill material with the cap ranging from four to six feet thick. The remaining 12 areas would have sand/clay mix as both the backfill material and the surface soil. Sand/clay soils should be suited for agricultural uses such as improved pasture. Forage crops would cover the majority of these sand/clay soils. In sand/clay mix areas, both the sand/clay substrate and dike remnants would be utilized in reforestation.

Below-Grade Sand/Clay Mix Areas and Below-Grade Clay Filled Areas: See discussion under Reclamation of Stream Channels and Wetlands.

Above-Grade Clay Filled Areas: The three above-grade clay filled areas (1,642 acres) remaining after reclamation would have phosphatic clay both as the backfill material and the reclaimed surface soil. This dominance of clay would result in a reclaimed soil with poor structural stability. Phosphatic clay soils are best suited to perennial forage crops which require no cultivation after establishment. Improved pasture would be the initial vegetative cover for the above-grade clay fill areas. Reforestation strands in reclaimed clay fill areas would be confined to plantings along the graded remnants of the waste disposal dike.

Overburden Fill Areas: The 12 overburden fill areas (733 acres) would have overburden as both the backfill and surface soil material. The areas would be reclaimed to approximately natural grade and would have good structural stability and drainage properties. Reclaimed overburden areas could constitute multi-purpose land suitable for a variety of structural and agricultural uses.

Graded Spoil Areas: Graded spoil areas (838 acres) would have overburden as the surface soil with no backfill material. Although below natural grade, the reclaimed areas would be graded to eliminate water pockets and provide drainage gradients towards Bowlegs Creek. The areas would have good structural stability; however, the reclaimed gradients required and the location of the areas would make them less suitable for structural development than the sand tailings and overburden fill areas. The favorable agronomic properties of the overburden would make the areas suitable for improved pasture or silvicultural uses.

Disturbed Natural Ground and Miscellaneous Backfill Areas: The reclaimed plant site area would include both natural ground and the clear water pool backfilled with overburden. As such, the area would have sufficient load bearing strength to permit unrestricted post-reclamation development. The natural and overburden surface soils would be capable of supporting agricultural uses such as improved pasture and silviculture. The initial plan is to reclaim this area as improved pasture.

Reclamation of Stream Channels and Wetlands: Stream channels and the following two types of wetland environment are included in the reclamation plans:

- Shallow depressions near the confluence of restored stream channels with natural drainage courses
- Below-grade sand/clay and clay landfill areas

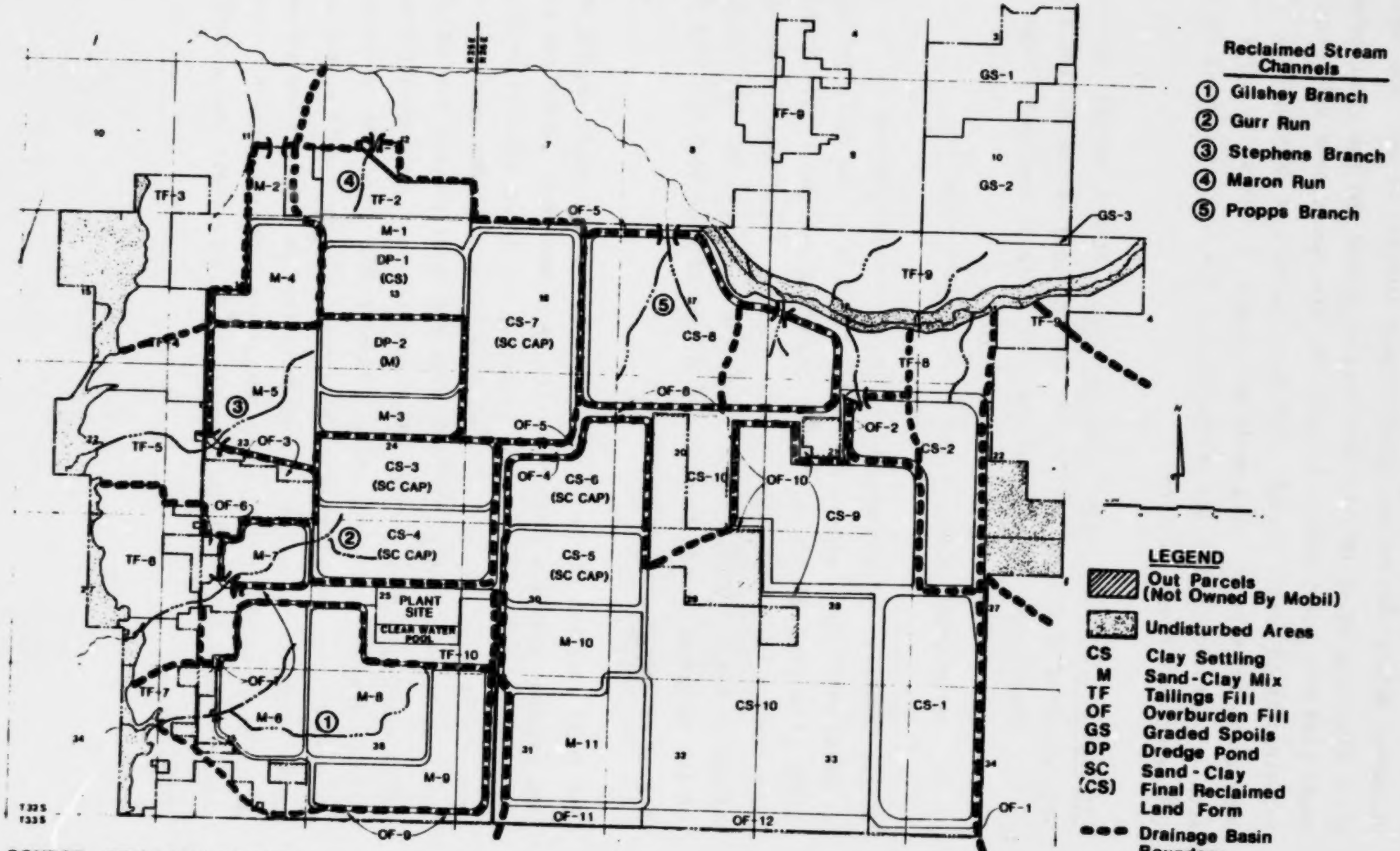
Stream Channels: Stream channel reclamation plans provide for the creation of a normal water level and an associated floodplain. The reclaimed upstream portions of Gilshey Branch, Gurr Run, Stephens Branch and Propps Branch would pass through reclaimed sand/clay mix areas or clay disposal areas capped with sand/clay mix. With the exception of Propps Branch, the downstream portions of all reclaimed stream channels would pass through sand tailings fill areas capped with overburden (Figure 2.6-H).

The exact location of the reclaimed stream channels would depend primarily on the internal drainage pattern in each reclaimed area. Since the wastes would be deposited hydraulically, all sand/clay mix areas and clay settling areas capped with sand/clay mix would be relatively flat. However, all settling areas would have gentle gradients from the inlet towards the outlet spillways which would typically persist after deactivation, although differential subsidence frequently creates shallow depressions. When the volunteer vegetation is cleared from the waste disposal areas during reclamation, the areas would be topographically mapped. Using these maps as a guide, the stream channels would be excavated to follow the prevailing drainage patterns within the areas. All reclaimed channels would tie in with their undisturbed downstream portions.

FIGURE 2.6-H

PROPOSED LOCATIONS AND APPROXIMATE DRAINAGE BASINS FOR RECLAIMED STREAM CHANNELS

(SAND/CLAY MIX)


Reclaimed Stream Channels
① Gilshey Branch
② Gurr Run
③ Stephens Branch
④ Maron Run
⑤ Propps Branch
LEGEND
▨ Out Parcels (Not Owned By Mobil)
Undisturbed Areas
CS Clay Settling
M Sand-Clay Mix
TF Tailings Fill
OF Overburden Fill
GS Graded Spoils
DP Dredge Pond
SC Sand-Clay
(CS) Final Reclaimed Land Form
Drainage Basin Boundary
GS-1
GS-2
GS-3
TF-2
TF-3
TF-5
TF-6
TF-7
TF-8
TF-9
TF-10
M-1
M-2
M-3
M-4
M-5
M-6
M-7
M-8
M-9
M-10
M-11
DP-1 (CS)
DP-2 (M)
CS-1
CS-2
CS-3 (SC CAP)
CS-4 (SC CAP)
CS-5 (SC CAP)
CS-6 (SC CAP)
CS-7 (SC CAP)
CS-8
CS-9
CS-10
OF-1
OF-2
OF-3
OF-4
OF-5
OF-6
OF-8
OF-9
OF-10
OF-11
OF-12
PLANT SITE
CLEAR WATER POOL
T32S
T33S

SOURCE: ZELLARS-WILLIAMS

Shallow Depressions: In order to provide additional wetland areas to receive surface drainage from the reclaimed site, nine shallow depressions are included in the reclamation plan; these depressions would be located at the outlet ends of reclamation areas. The reclaimed wetlands would consist of a small area of permanently standing water around the overflow drainage swale surrounded by a larger, gently sloping area that would be seasonally flooded.

Below-Grade Sand/Clay Mix and Below-Grade Clay Filled Areas: Following introduction of backfill, these areas would be drained to promote subsidence of the fill and formation of a surface crust. The protruding spoil piles would then be graded into the partially filled mine cuts until the spoils are slightly below natural grade and slighty above the subsided elevation of the backfill material. The graded spoil areas are intended for wetland reforestation while the backfilled interspoil areas with a longer hydroperiod are intended for marsh reclamation.

Revegetation: The six types of revegetation programs established in the sand/clay mix reclamation plan are as follows: reforestation along reclaimed stream channels, wetland reforestation, nonforested wetland revegetation, upland mixed reforestation, commercial pine plantings and improved pasture. Soil differences would influence the location and extent of the various types of revegetation.

Reforestation Along Stream Channels: The reclaimed stream channels would be reforested with native tree species in the same manner as discussed in the proposed action. Approximately 263 acres of wetlands would be reforested along the reclaimed stream channels. The areas include portions of Gilshey Branch, Gurr Run, Stephens Branch, Propps Branch, Maron Run and several unnamed tributaries to Bowlegs Creek.

Wetland Reforestation: Graded spoil areas within below-grade fill areas of CS-9 and CS-10 would be reforested as freshwater swamps with native wetland species. Hydric species would be planted along the margins of the interspoil marshes, and the species which could not tolerate prolonged flooding would be planted on the graded spoil. These plantings would be conducted in the same manner as the forested stream channels. A total of 746 acres would be reforested in this manner.

Nonforested Wetland Revegetation: Approximately 1,615 acres would be reclaimed as freshwater marsh areas. These areas would be located in the interspoil regions within the below-grade settling areas (CS-9 and CS-10) and shallow depressions found in above-grade settling areas. These areas would be planted in the same manner discussed under the proposed action.

Upland Mixed Reforestation: Upland mixed reforestation would occur on 1,826 acres. As in the proposed action, these areas would be located adjacent to undisturbed forested areas and as elongated strands in the reclamation areas. In the sand/clay mix plan the potential exists for utilizing both sand/clay substrate and dike remnants for reforestation. Therefore, at the junction of various strands, the planting zone would be expanded to form reforestation blocks. A variety of native hardwood and coniferous trees would be included in the reforestation plantings. Species such as longleaf pine, live oak and dogwood would be planted on the well drained sites, while species such as water oak, laurel oak, sweetgum and slash pine would be planted on the wetter sites.

Commercial Pine Plantings: Approximately 431 acres would be planted with pine in the same manner discussed under the proposed action. The locations for this reforestation include Areas TF-2 and M-4, a slightly smaller total area than was planned under the conventional reclamation plan. These plantings are intended primarily to replace the value of existing pine plantations.

Improved Pasture: Improved pasture would be planted throughout the reclaimed site comprising 10,421 acres. These areas would be revegetated in the same manner as discussed under the proposed action. As with the sand/clay cap plan, Coastal and Callie bermudagrass varieties may be planted in addition to the Pensacola bahiagrass in some of the better drained sand/clay and overburden soils.

Annual Reclamation Schedule: Table 2.6-5 summarizes the reclamation schedule for the sand/clay mix case. A total of three years after final fill has been

TABLE 2.6-5

ANNUAL RECLAMATION SCHEDULE
(Sand/Clay Mix Plan)

Year	Areas Reclaimed	Acreage Reclaimed During Year	Reclaimed Acreage Cumulative Total
1			
2	OF-1	33	33
3			
4			
5	OF-2	11	44
6			
7	TF-1	20	64
8			
9	TF-2	218	282
10	OF-3	28	310
11			
12	TF-3, M-3	284	594
13	M-1, M-2, M-4	405	999
14	TF-4, OF-4	313	1,312
15	TF-5, M-5	731	2,043
16	OF-5	66	2,109
17	OF-6	20	2,129
18	TF-6	286	2,415
19	OF-7, OF-8, CS-1, CS-2 CS-3, CS-4, GS-1	2,598	5,013
20	TF-07, OF-9, CS-5, GS-2	1,221	6,234
21	M-6, M-7, GS-3	542	6,776
22	TF-8, CS-6	660	7,436
23	OF-10	55	7,491
24	OF-11, M-8, TF-9	1,605	9,096
25	M-9	410	9,506
26	CS-7, TF-10	810	10,316
27	M-10	330	10,646
28	OF-12	120	10,766
29	Plant site and ancillary facilities	169	10,935
30	M-11, CS-8	1,520	12,455
31	DP-2, CS-9	972	13,427
32			
33			
34	CS-10, DP-1	1,767	15,194

SOURCE: ZELLARS-WILLIAMS

allotted to complete reclamation of sand tailings and overburden landfills. Of this total, two years would be utilized in grading the areas to approved slopes, establishing drainage and planting a vegetative cover. The third year would be allotted for the vegetative cover to become established.

A total of five years after final fill is required to complete the reclamation of sand/clay reclamation areas and clay settling areas capped with sand/clay mix. Two years would be allowed for the material to conslidate to approximately 30 percent clay solids. The next two years would be used to grade the areas to approved slopes, establish drainage and plant a vegetative cover. The final year would be required to allow the vegetative cover to become established.

After final fill, seven years have been allotted to complete reclamation of clay settling areas. Of this total, three years would be required for the areas to consolidate to 22 percent solids; three years would be needed to grade, establish drainage and plant a vegetative cover; and one additional year would be required to allow the vegetative cover to become established.

2.6.3.2 Environmental Considerations

Environmental Advantages: The sand/clay mix reclamation plan has the greatest acreage in both reclaimed wetland areas and reforested stream channels and reclaimed upland mixed forested areas (equivalent in acreage to the overburden/clay plan mix). The greater surface area with 2:1 sand/clay mix or overburden mix would increase the surface permeability and slightly reduce runoff flows from the site (as compared to the conventional plan).

Environmental Disadvantages: This reclamation alternative would have by a slight margin the poorest land use potential of all the alternatives (short and long-term stability). The agronomic value would be second poorest (to the conventional plan) of the four alternatives. The sand/clay mix plan also has the second highest potential dike failure risk rating and soil radium concentrations of all the alternatives.

2.6.4 OVERBURDEN/CLAY MIX PLAN

2.6.4.1 General Description

The reclamation plan following overburden/clay mix waste disposal is similar to the plan developed for the sand/clay mix case. The primary difference from a reclamation perspective is the increased amount of sand/clay mix acreage and the associated reduction of uncapped clay filled areas. Both plans provide for the restoration of 60,000 linear feet of stream channels and approximately 2,493 acres of wetland cover types. The reclaimed site would also have approximately 2,495 acres of upland hardwood and mixed forest. Acreage for the land use categories are the same as those developed for the sand/clay mix plan (Table 2.6-6). Stream channel and wetland reclamation would be accomplished for this reclamation plan in much the same way as the sand/clay cap and mix plans. Revegetation of the reclaimed areas would be accomplished in the same manner described in the sand/clay mix plan. All six types of vegetation would have approximately the same total acreages and the same general site locations as the sand/clay mix plan. Listed below are the six types of revegetation programs along with their total acreages and site locations.

Reforestation Along Reclaimed Stream Channels:

Acres	- 263
Location	- Portions of Gilshey Branch, Gurr Run, Stephens Branch, Propps Branch, Maron Run and several unnamed tributaries to Bowlegs Creek, at the approximate locations of the existing streams.

Wetland Reforestation:

Acres	- 746
Location	- Graded spoil areas within below-grade fill areas of CS-9 and CS-10.

Nonforested Wetlands:

Acres	- 1,615
Location	- Interspoil regions within the below-grade settling areas (CS-9 and CS-10) and shallow depressions found in above-grade settling areas.

TABLE 2.6-6

LAND USE CATEGORIES
(Overburden/Clay Mix Plan)

Land Use/Cover	Acreage
Agricultural Land	10,421
Cutover Flatwoods	182
Upland Hardwoood Forest	664
Upland Mixed Forest	1,831
Planted Pine	431
Water Areas	3
Forested Stream Channel	263
Freshwater Swamp	857
Freshwater Marsh	1,636
Developed Land	0
Cropland	0
Total	16,288

SOURCE: ZELLARS-WILLIAMS

Upland Mixed Reforestation:

Acres - 1,826

Location - Adjacent to undisturbed forested areas and throughout the reclaimed areas in elongated strands and junction blocks at the intersections of the elongated strands (same as areas found on Figure 2.6-G).

Commercial Pine Planting:

Acres - 431

Location - TF-2 and M-4 (same as areas found on Figure 2.6-G)

Improved Pasture:

Acres - 10,421

Location - Throughout reclaimed site (same as areas found on Figure 2.6-G).

2.6.4.2 Environmental Considerations

Environmental Advantages: This method of reclamation would have essentially the same advantages as the sand/clay mix plan. One additional advantage would be the elimination of all above-grade clay settling areas by replacement with overburden sand/clay mix areas. The greater surface area with 2:1 sand/clay mix or overburden mix should increase the surface permeability and slightly reduce runoff flows from the site.

Environmental Disadvantages: The overburden mix plan's disadvantages are essentially the same as those of the sand/clay mix plan.

2.6.5 SUMMARY COMPARISON

Potential land use is the primary area of concern regarding reclamation. Based on the different land types resulting after reclamation, a rating system was developed to compare the soil bearing capacity and agronomic value on a relative weighted bases for the total site for the proposed action and the alternative reclamation plans. Each landform was rated on a scale of 1 to 10, with 10 equivalent to existing conditions based on analysis presented in Section 3.2 (Geology and Soils). A weighted overall site rating was then calculated for short-term and long-term soil bearing capacity value, as well as for agronomic value. Tables 2.6-7, 2.6-8, and 2.6-9 show these ratings, respectively.

The conventional reclamation plan, while it is the most proven technique, carries with it some significant disadvantages. These disadvantages include the least amount of wetland acreage, the largest acreages of above-grade clay settling areas and the highest post-reclamation levels of soil radioactivity. Clay settling areas are also the most difficult to dewater. While the sand/clay mix plan would have soils with increased fertility and would provide slightly greater artesian aquifer recharge, the disadvantages associated with this plan would outweigh the advantages. There would be greater short and long-term structural stability problems and the reclamation of Propps Branch would be more difficult in the sand/clay mix due to the instability of the mixture. The overburden/clay mix plan's advantages and disadvantages are essentially the same as the sand/clay mix plan. The advantages of the sand/clay cap reclamation plan significantly outweigh the disadvantages in that the agronomic value of the land is the best of all the alternatives, the radon-226 concentration is half that of the conventional plan and the drainage patterns would be altered slightly less than the conventional plan. The only apparent potential disadvantage of any consequence is that the sand/clay cap reclamation techniques have not been fully proven in the industry. In conclusion, the sand/clay cap reclamation plan is the environmentally preferred alternative.

2.7 WATER SOURCE ALTERNATIVES

Water management techniques at the South Fort Meade Mine would permit water to be recovered from ore transportation, washing, feed preparation, flotation process and waste disposal, thus minimizing effluent discharges and consumptive uses. The proposed mine water system is presented in Figure 2.7-A and a summary of the water balance is presented in Table 2.1-3. Approximately 90 percent (157.2 mgd) of the water uses in Mobil's mining operation would be supplied from the recirculation system. The South Fort Meade Mine would also require a water source of 16.413 mgd. Mobil proposes to utilize groundwater as the source of process water, makeup water, pump seal water and potable

TABLE 2.6-7

LAND USE POTENTIAL EVALUATION SHORT-TERM STRUCTURAL RATING*

Land Type	Relative Rating	Conventional Plan		Sand/Clay Cap Plan		Sand/Clay Mix Plan		Overburden Mix Plan	
		Acres	Wt. Value	Acres	Wt. Value	Acres	Wt. Value	Acres	Wt. Values
Sand Tailings Capped with Overburden	10	5,034	50,340	5,079	50,790	3,020	30,200	3,020	30,200
Clay Capped with Sand Tailings	5	1,489	7,445	0	0	0	0	0	0
Clay	2	6,681	13,362	0	0	1,642	3,284	0	0
Clay Capped with Overburden	3	0	0	590	1,770	0	0	0	0
Sand/Clay Mix or Overburden Sand/Clay Mix (2:1)	3	0	0	0	0	3,512	10,536	5,492	16,476
Overburden	10	477	4,770	432	4,320	1,740	17,400	1,740	17,400
Clay Capped with Sand/Clay Mix (2:1)	3	0	0	0	0	3,185	9,545	2,847	8,541
Clay Capped with Sand/Clay Mix (4:1)	3	0	0	7,580	22,740	0	0	0	0
Water	1	1,513	1,513	1,513	1,513	2,095	2,095	2,095	2,095
Total		15,194	77,430	15,194	81,133	15,194	73,060	15,194	74,712
Weighted Relative Rating			5.1		5.3		4.8		4.9

*Short-term soil bearing capacity is defined as the expected soil bearing capacity at the conclusion of reclamation activities.

SOURCE: STUDY DATA

TABLE 2.6-8

LAND USE POTENTIAL EVALUATION LONG-TERM STRUCTURAL RATING*

Land Type	Relative Rating	Conventional Plan		Sand/Clay Cap Plan		Sand/Clay Mix Plan		Overburden Mix Plan	
		Acres	Wt. Value	Acres	Wt. Value	Acres	Wt. Value	Acres	Wt. Values
Sand Tailings Capped with Overburden	10	5,034	50,340	5079	50,790	3,020	30,200	3,020	30,200
Clay Capped with Sand Tailings	6	1,489	8,934	0	0	0	0	0	0
Clay	3	6,681	20,043	0	0	1,642	4,926	0	0
Clay Capped with Overburden	5	0	0	590	2,950	0	0	0	0
Sand/Clay Mix or Overburden Sand/Clay Mix (2:1)	5	0	0	0	0	3,512	17,560	5,492	27,460
Overburden	10	477	4,770	432	4,320	1,740	17,400	1,740	17,400
Clay Capped with Sand/Clay Mix (2:1)	4	0	0	0	0	3,185	12,740	2,847	11,388
Clay Capped with Sand/Clay Mix (4:1)	5	0	0	7,580	37,900	0	0	0	0
Water	1	1,513	1,513	1,513	1,513	2,095	1,513	2,095	2,095
Total		15,194	85,600	15,194	97,473	15,194	84,921	15,194	88,543
Weighted Relative Rating			5.6		6.4		5.6		5.8

---

*Long-term soil bearing capacity is defined as the expected soil bearing capacity ten years after reclamation has been completed.

SOURCE: STUDY DATA

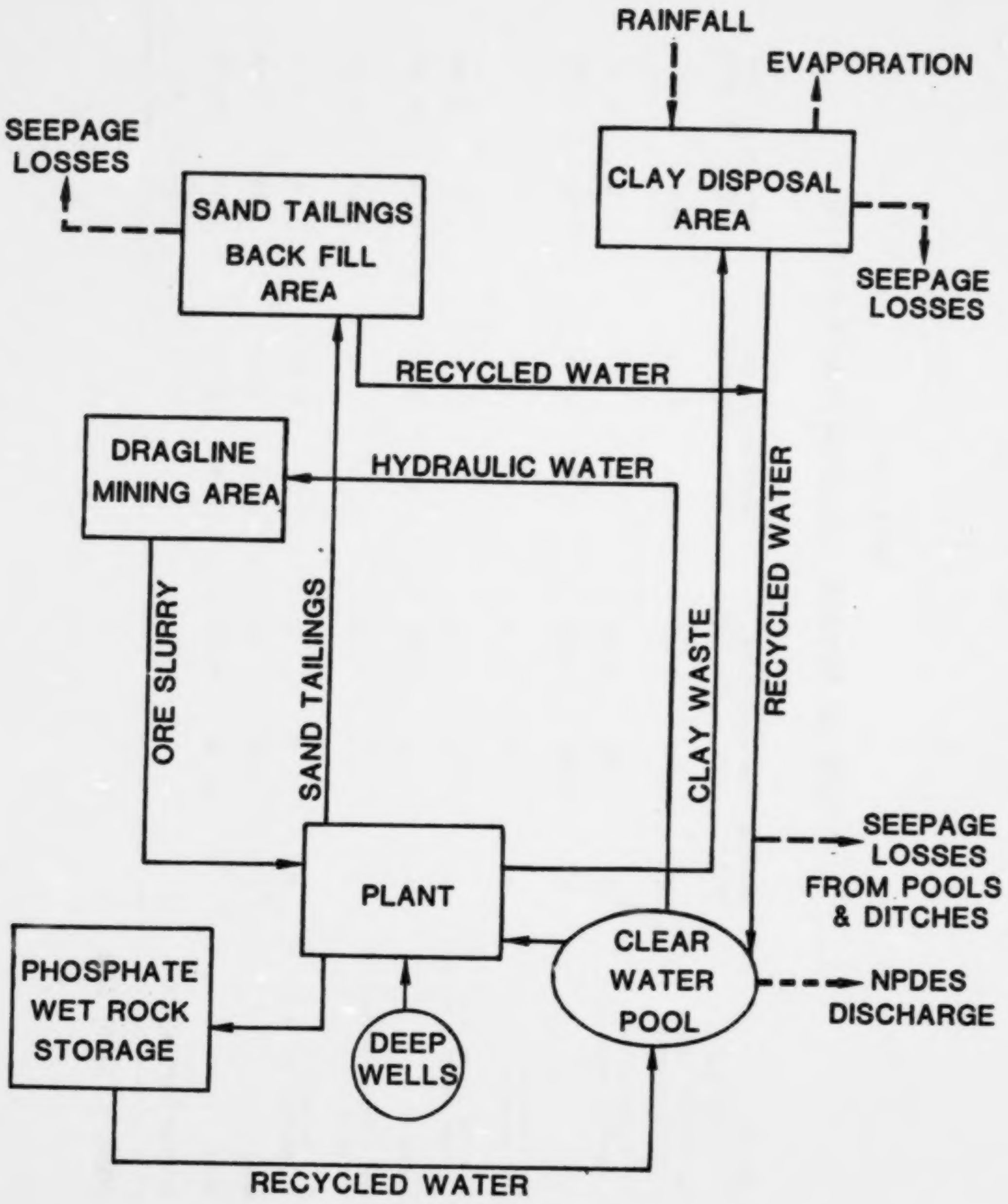
TABLE 2.6-9

LAND USE POTENTIAL EVALUATION AGRONOMIC RATING

Land Type	Relative Rating	Conventional Plan		Sand/Clay Cap Plan		Sand/Clay Mix Plan		Overburden Mix Plan	
		Acres	Wt. Value	Acres	Wt. Value	Acres	Wt. Value	Acres	Wt. Values
Sand Tailings Capped with Overburden	9	5,034	45,306	5,079	45,711	3,020	27,180	3,020	27,180
Clay Capped with Sand Tailings	2	1,489	2,978	0	0	0	0	0	0
Clay	5	6,681	33,405	0	0	1,642	8,210	0	0
Clay Capped with Overburden	9	0	0	590	5,310	0	0	0	0
Sand/Clay Mix or Overburden Sand/Clay Mix (2:1)	7	0	0	0	0	3,512	24,584	5,492	38,444
Overburden	10	477	4,770	432	4,320	1,740	17,400	1,740	17,400
Clay Capped with Sand/Clay Mix (2:1)	7	0	0	0	0	3,185	22,295	2,847	19,929
Clay Capped with Sand/Clay Mix (4:1)	8	0	0	7,580	60,640	0	0	0	0
Water	1	1,513	1,513	1,513	1,513	2,095	2,095	2,095	2,095
Total		15,194	87,972	15,194	117,494	15,194	101,764	15,194	105,048
Weighted Relative Rating			5.8		7.7		6.7		6.9

SOURCE: STUDY DATA

MINE WATER SYSTEM


RAINFALL
EVAPORATION
SEEPAGE LOSSES
SAND TAILINGS BACK FILL AREA
CLAY DISPOSAL AREA
SEEPAGE LOSSES
RECYCLED WATER
DRAGLINE MINING AREA
HYDRAULIC WATER
RECYCLED WATER
ORE SLURRY
SAND TAILINGS
CLAY WASTE
SEEPAGE LOSSES FROM POOLS & DITCHES
PLANT
CLEAR WATER POOL
NPDES DISCHARGE
PHOSPHATE WET ROCK STORAGE
DEEP WELLS
RECYCLED WATER

SOURCE: MOBIL

water. An alternative to the groundwater supply would be the utilization of surface water sources. Due to the high quality water required for process water in the flotation system, treatment of the surface water would be necessary. The uses and sources of process and other aqueous streams are provided in Figure 2.7-A and Table 2.1-2.

2.7.1 GROUNDWATER WITHDRAWAL (MOBIL'S PROPOSED ACTION)

2.7.1.1 General Description

Mobil proposes to withdraw 15.7 mgd of groundwater for flotation process and makeup water from the Lower Floridan Aquifer utilizing three wells to a depth of approximately 1,000 feet. Groundwater would also be withdrawn for pump seal water and potable water from the Upper Floridan Aquifer at a rate of 0.713 mgd using wells approximately 240 feet deep. The withdrawal points for the Upper Floridan Aquifer water would change during the life of the mine. The proposed withdrawal of 16.413 mgd of groundwater was approved by the Southwest Florida Water Management District (SWFWMD), and Consumptive Use Permit (CUP) No. 205403 was issued to Mobil on October 7, 1980.

2.7.1.2 Environmental Considerations

Environmental Advantages: The use of groundwater to supply the water demands of the mine would not require the energy and other resources for treatment facilities. Using groundwater as a supply source (rather than surface water) would not alter surface water flows of Bowlegs Creek or the Peace River, nor would the downstream biological communities be affected.

Environmental Disadvantages: A disadvantage of withdrawing 15.7 mgd from the Lower Floridan Aquifer would be the dropping of the piezometric surface of the aquifer (approximately 3.3 feet over the site). The withdrawal of pump seal water (0.691 mgd) and potable water (0.022 mgd) from the Upper Floridan Aquifer would lower the water level of this aquifer. More energy would be required to pump groundwater from deep wells than from nearby surface water sources.

2.7.2 SURFACE WATER IMPOUNDMENT

2.7.2.1 General Description

Two surface water bodies considered as alternative water sources were Bowlegs Creek and the Peace River. The 7-day, 10-year low flows in Bowlegs Creek (zero mgd) and the Peace River (7.1 mgd) are not sufficient to meet the daily water requirements (16.413 mgd) of the mine. Therefore, an impoundment would have to be constructed on Bowlegs Creek. This source of water would probably require augumentation by groundwater withdrawal. The amount of water supplied by rainfall catchment is considered to be offset by the amount lost to evaporation. Surface water would require treatment to remove organic material and suspended solids since these pollutants would adversely affect the flotation process performance and reagent utilization.

2.7.2.2 Environmental Considerations

Environmental Advantages: If surface water were used for water supply, the impacts to the piezometric surface of the Lower Floridan Aquifer would be reduced. Reduction in groundwater consumption by use of surface water supply would reduce the energy requirements for pumping water. The impoundments created for surface water storage could provide aquatic habitat for wildlife.

Environmental Disadvantages: Construction of surface water impoundments would encroach on the buffer areas preserved from mining. Withdrawal of surface water would reduce downstream flows resulting in disturbances of the natural floodplains, wetland areas, and aquatic systems. Treatment of the surface water require additional chemicals and energy for treatment and would generate waste sludge for disposal. In the event of a dam failure, the impounded water would represent a flood hazard to downstream areas.

2.7.3 SUMMARY COMPARISON

The primary environmental impact associated with utilizing groundwater withdrawal is the lowering of the piezometric surface of the Lower Floridan Aquifer. This effect and the demands of other users have been evaluated by the SWFWMD which is responsible for determining the permissible amounts of water to be withdrawn by all major users in the SWFWMD region. The fact that Mobil was granted a CUP by SWFWMD is judged to represent their determination that the anticipated effect on the Floridan Aquifer is acceptable. Given all other environmental considerations relative to the two methods, groundwater withdrawal is the environmentally preferred alternative.

2.8 PLANT SITING ALTERNATIVES

The desired location for the beneficiation plant should be one that minimizes matrix pumping distances, minimizes the loss of phosphate resources by occupying the surface with structures that prevent mining the area, and does not disturb environmentally sensitive areas.

2.8.1 GILSHEY BRANCH (MOBIL'S PROPOSED ACTION)

2.8.1.1 General Description

The processing plant would be located on the west side of Manley Road approximately two miles north of County Line Road (Figure 2.1-F). The plant would be located in an area that is now primarily pasture. The objectives in siting the plant were to minimize the energy requirements associated with matrix transfer (by locating at the centroid of the phosphate reserves). The proposed location is the matrix centroid of pumping distances on the site. The plant site would be adjacent to an existing road providing easy access for employees and deliveries. This location would be suitable for utilization of rail transporation (discussed in Section 2.10, Product Transport Alternatives).

2.8.1.2 Environmental Considerations

Environmental Advantages: The Gilshey Branch plant location would be the most energy efficient since it would utilize the minimum pumping distances. No environmentally sensitive areas would be destroyed at this location since it is currently used for pasture. The plant would be an appreciable distance from any off-site residents; therefore, noise and fugitive dust would not affect adjacent property owners.

Environmental Disadvantages: The location of the plant would preclude mining of approximately 1.1 million tons of phosphate reserves under the site.

2.8.2 OTHER ON-SITE LOCATIONS

2.8.2.1 General Description

The proposed mine site was examined on a conceptual basis for other potential locations for the beneficiation plant. Placement of the plant site in another location on the proposed mine site would increase the matrix pumping disturbances. Other alternative locations could entail disturbance of environmentally sensitive areas.

2.8.2.2 Environmental Considerations

Environmental Advantages: Location of the plant in an area with lesser phosphate reserves would reduce the amount of phosphate resource withheld from mining.

Environmental Disadvantages: Placement of the plant site in another location on the proposed mine site would increase the energy requirements of the pumping systems. Some alternative locations would entail disturbance of environmentally sensitive areas. A location nearer the property boundaries could also cause noise and dust disturbances affecting adjacent property owners.

2.8.3 SUMMARY COMPARISON

The environmentally preferred alternative is the plant siting at the Gilshey Branch site since it is the most energy efficient location, no environmentally sensitive areas would be destroyed and noise and dust emissions would not affect adjacent property owners.

2.9 WATER DISCHARGE ALTERNATIVES

The primary discharge from the mining area would occur from the 45-acre clear water pool adjacent to the processing facility. Mobil proposes to discharge water to the Peace River by way of a vegetated outfall ditch constructed parallel to the railroad route. An alternative discharge stream is Bowlegs Creek. The proposed mine would have an intermittent discharge from the clear water pool primarily between the months of May and October. The discharged volume is directly dependent on local rainfall trends and is expected to be the greatest between June and September, a period when tropical storms are frequent in Florida. During the wet season the normal and maximum discharge volumes will be 9 mgd and 20 mgd, respectively. These values were derived from normal and maximum precipitation and evaporation rates for the area, the maximum areas undergoing mining at any time, and the maximum quantity of water which would be utilized for processing.

2.9.1 THE PEACE RIVER (MOBIL'S PROPOSED ACTION)

2.9.1.1 General Description

Under the proposed plant siting, the clear water pool discharge would flow into the Peace River by way of a vegetated drainage swale along the railroad route. An evaluation of the present surface water characteristics and the projected characteristics during mining operations (Section 3.5, 2.2.7) indicates that if the mine effluent were mixed with the Peace River's average flow between June and September, the concentrations of TSS, total phosphorus and fluoride would be 30 mg/1, 2 mg/1 and 1.2 mg/1 respectively. These values are essentially the same as those naturally occurring from the mass loadings of the existing tributaries.

2.9.1.2 Environmental Considerations

Environmental Advantages: Discharge to the Peace River would not significantly alter the concentrations of total suspended solids, total phosphorus, and fluoride in the river. The average wet season discharge would increase the average flow of the Peace River by five percent. Discharge to the Peace River could be done by gravity flow without the additional energy requirements associated with pumping.

Environmental Disadvantages: Mass loadings from the mine discharge would increase the suspended solids and phosphorous mass loadings in the Peace River by two percent and the fluoride mass loadings in the Peace River by eight percent.

2.9.2 BOWLEGS CREEK

2.9.2.1 General Description

Construction of a pump station and a transfer line from the clear water pool to Bowlegs Creek would be necessary in order to implement this alternative.

The discharge characteristics would be the same if the discharge were directed to Bowlegs Creek instead of to the Peace River. The average mine discharge of 9 mgd would increase Bowlegs Creek's flow (between June and September) by 37 percent. An evaluation of the present characteristics of Bowlegs Creek and the projected characteristics of the creek during mining operations indicates that concentrations of the several water quality parameters would increase with the introduction of the mine effluent. When the mine effluent is mixed with Bowlegs Creek's average flow between June and September the TSS concentrations would increase from 10 mg/l to 14 mg/l, the total phosphorus concentration would increase from 0.24 mg/l to 0.98 mg/l, and the fluoride concentration would increase from 0.14 mg/l to 0.64 mg/l.

2.9.2.2 Environmental Considerations

Environmental Advantages: There are no apparent environmental advantages associated with discharging to Bowlegs Creek.

Environmental Disadvantages: The increased flow could cause erosion of stream channels which would increase turbidity and alter the existing biological communities. The mass discharges of pollutant constituents could also adversely affect the water quality and the biota of the creek. This alternative would also be more energy intensive since it requires pumping the effluent from the clearwater pool to Bowlegs Creek.

2.9.3 SUMMARY COMPARISON

While there are no advantages to discharging to Bowlegs Creek, there are several disadvantages including water quality degradation, increased impacts on the biota, and increased energy consumption. The Peace River would provide additional dilution to buffer any impacts of the discharge. Therefore, discharge to the Peace River is the environmentally preferred alternative.

2.10 PRODUCT TRANSPORT ALTERNATIVES

The phosphate product would be transported from the South Fort Meade Mine to Mobil's existing drying facilities in Nichols. Mobil's proposed action is to construct a new six-mile railroad spur to the mine site and transport the product by rail. An alternative method of shipment is to truck the product as described below.

2.10.1 RAILROAD (MOBIL'S PROPOSED ACTION)

2.10.1.1 General Description

The wet phosphate rock produced at South Fort Meade would be transferred into open top, bottom discharge hopper rail cars for transport to an existing facility at Nichols. During Phase I operations, one train with 33 cars would make two daily trips between the beneficiation plant and Nichols. During Phase II operations, the same number of train trips would be required but the train would have 65 cars. Mobil would construct a 6-mile rail spur from the plant site to the existing Seaboard Coast Line track (Figure 2.1.F). A bridge would be built to cross the Peace River and a grade crossing would be required on Mt. Pisgah Road. The rail cars would be pushed twice each day from the beneficiation plant to the main track and returned.

2.10.1.2 Environmental Considerations

Environmental Advantages: The train would be an efficient energy user and could haul 6,500 tons of product for each trip.

Environmental Disadvantages: A train would disrupt traffic at the Mt. Pisgah Road crossing for approximately six minutes, four times each day and would generate some minor noise (below 55 dBA at the closest receptor). Tracks, a bridge, and a grade crossing would have to be constructed. Their construction would temporarily disrupt terrestrial biota and adjacent land and the aquatic biota of the Peace River.

2.10.2 TRUCK PRODUCT TRANSPORT

2.10.2.1 General Description

Product transport by diesel engine truck could be accomplished during Phase I with 25-ton capacity trucks making 260 round trips per day from the South Fort Meade Mine site to Nichols. During Phase II, 520 truckloads per day will be necessary. Operation and maintenance of the trucks would require 100 people for Phase I and 200 for Phase II.

2.10.2.2 Environmental Considerations

Environmental Advantages: The only apparent advantage is that there would probably be less volume associated with a truck spill than with a railcar spill.

Environmental Disadvantages: Trucks would require six times the fuel consumption of one train for equal cargos. Air pollution, noise, and safety hazards generated by 520 truck trips per day would exceed that generated from the train. Roads and bridges would have to be improved to handle the additional traffic and would also require increased road maintenance.

2.10.3 SUMMARY COMPARISON

Increased air pollution, noise and energy consumption are overriding disadvantages to truck transport. Therefore, railroad transport of the product is the environmentally preferred alternative.

2.11 MITIGATION MEASURES

This section presents possible mitigation measures not already included in the proposed action or alternatives. These measures were developed from input received from preparers of the various sections of the EIS.

2.11.1 GEOLOGY AND SOILS

Mobil shall employ high profile overburden stacking in the mining of the area covered by Clay Settling Area 10 (CS-10) to the maximum extent compatible with toe spoiling of the leach zone. If any increase in waste storage volume is realized by the use of this technique, it shall be reflected in a lower reclaimed elevation for the area rather than an increase in clay storage within CS-10.

2.11.2 BIOLOGICAL RESOURCES

Before beginning any land-disturbing activities, Mobil shall develop a program whereby indigo snakes encountered in the work area are captured and turned over to the Florida Game and Fresh Water Fish Commission (FGFWFC) Endangered Species Coordinator for relocation to other suitable habitats in the region. (The technique for handling and keeping this species until the

FGFWFC arrives is to place the snake in a cloth sack, out of the sun, preferably in an air conditioned building.) The program shall include informing Mobil workers of the importance of the indigo snake, familiarizing them with its appearance and instructing them as to its preservation. In addition, the gopher tortoise population in the site area shall be protected to the extent possible. Mobil shall maintain and submit a record of the program to the U.S. Fish and Wildlife Service office in Jacksonville, Florida.

Mobil shall not conduct any mining, or any activity associated with its mining operation, within 1,500 feet in any direction of the bald eagle nest located in T32S, R26E, Section 9. Beginning four years prior to site preparation activities preceding mining of the areas closest to the eagle nest (to the east, south and west), Mobil shall provide for a field study to be performed by a qualified biologist to determine the area(s) being utilized for feeding by the eagles. Observations shall be conducted from January 1 through April 15 of the specified year. Since young may or may not be produced in any given year, Mobil shall attempt to provide data for at least one successful nestling period during the referenced four years. Specifics of the study shall be coordinated with and reviewed by the USF&WS office in Jacksonville, Florida. If it appears at the onset of the study year that the subject eagle nest is no longer in existence, that fact must be confirmed by a letter from the USF&WS. If the results of the study reveal that the eagles are utilizing an area on the Mobil property for feeding, Mobil shall preserve that area from disturbance.

Mobil shall conduct a monitoring program to assess the wetlands restoration and re-creation effort at the South Fort Meade Mine. Three wetland recreation areas, a depression wetland in sand/clay capped area CS-1, the reforested stream channel of Maron Run, and the forested wetland in area CS-14 shall be monitored for one year according to the following program: (1) Beginning 12 weeks after completion of the reclamation of each respective area, the water level shall be monitored biweekly; and (2) Follow-ing the first full growing season, a biological assessment shall be performed by a degreed biologist for each of the three areas; the assessment shall include a listing of wetland plant species present, mapping of their location, a visual estimate of the amount of cover provided by the wetland species, and sampling of the benthic macroinvertebrates to yield a list of the species collected and their density. After the above-described monitoring program is performed for both the sand/clay depression area and the forested stream channel, one area shall be selected by EPA for long-term monitoring by Mobil. This long-term monitoring program shall consist of a yearly biological assessment by a degreed biologist to include the items in (2) above. In addition, in order to determine the degree of subsidence occurring, if any, the maximum depth of the marsh depression area relative to a fixed elevation point shall be monitored quarterly for the life of this permit. Mobil shall submit annual reports of the described monitoring program to the EPA Region IV Ecology Branch.

2.11.3 GROUNDWATER

During the mining activities conducted near the Bowlegs Creek preserved area, Mobil shall monitor the Shallow Aquifer to assess the effectiveness of the perimeter ditch in preventing dewatering of the preserved area. This monitoring program shall consist of using the existing well SA-3 to perform weekly manual water level measurements during the first sixteen weeks of mining near Bowlegs Creek and monthly thereafter until the mining pit immediately adjacent to the preserved area is closed. Mobil shall not allow the Surficial Aquifer in this preserved area to be lowered more than three feet due to the mining activities.

2.12 THE NO ACTION ALTERNATIVE

The no action alternative by EPA would be the denial of an NPDES permit for the proposed project. The effect of permit denial would be to precipitate one of three possible reactions on the part of Mobil: (1) termination of their proposed project; (2) indefinite postponement of the proposed project; or (3) restructuring of the project to achieve zero discharge, for which no NPDES permit would be required.

2.12.1 Termination Of The Project

Termination of the planned project would allow the existing environment to remain as described in Section 3.0. However, there would be adverse socioeconomic effects due to the loss of 175 jobs when the Fort Meade mine is phased out. Specifically, the meteorologic and noise characteristics are expected to remain as described in Section 3.1.1. However, air quality changes may occur due to emissions from new sources permitted in the region in the coming years or because of changes in fuels used at existing sources. The geologic features of the site would remain as described in Section 3.2.1, and the existing soils would continue to support established vegetation, grazing lands, and limited agricultural crop production.

If the project were terminated, the Mobil site would remain in its present radiological state, leaving outdoor gamma radiation and radon flux at lower levels than would be the case after reclamation. Accordingly, any potential adverse effects that might result from the redistribution of subsurface radioactivity would not occur.

Termination of the project would also mean no appreciable changes in the existing withdrawal quantities of groundwater. The hydrologic characteristics of the Surficial Aquifer, natural groundwater recharge quantities, and baseflow to local surface waters would be expected to remain as at present. Groundwater quality under this no action alternative will depend on future land uses. If land use patterns in the vicinity of the site continue much as they are, then groundwater quality should also remain essentially as it is today.

Under the no action alternative of project termination, no appreciable changes in the existing surface water quantity are anticipated. Surface water quality will depend on future land use. If land use patterns in the immediate area remain fairly constant over the next few decades, surface water quality should remain much as it is today. If other phosphate mining and processing projects are permitted, surface water streams may show increases in TDS, sulfate, phosphate, nitrogen, and fluorides.

If the proposed project were terminated, the aquatic environment with its alternating hydroperiod and tolerant organisms would remain as it now exists (Section 3.6.1); however, natural succession of marshes into bayheads would in time modify some aquatic habitats. The terrestrial ecology of the Mobil site should remain as now, with most of the site continuing to be used for agricultural purposes including livestock grazing and citrus groves.

If Mobil does not develop the South Fort Meade site as a replacement mine when the Fort Meade Mine is exhausted, the contribution to the economy of the area through employment, tax payments and other economic factors will decline and eventually cease with the completion of mining at the Fort Meade facility. The $2.5 million annual revenue, generated by the proposed project through ad valorem taxation and redistribution of sales tax collected in Polk County, would not materialize. Present land uses would likely continue, but it is probable that the property value of the site would drop (relative to the value for phosphate mineable land).

Termination of the project would also preclude the generation of about $5.6 million a year in severance tax, of which 50 to 75 percent would go to the State General Revenue Fund and the remainder to the Land Reclamation Trust Fund and the Florida Institute of Phosphate Research. The primary economic effect of the no-action alternative would be felt by the 175 Mobil employees dependent for their jobs and income from the Fort Meade mine, scheduled to be closed in the near future.

Termination of the project would mean that no known or unknown archaeological or historic sites would be destroyed by the proposed mining. The 15 historic sites recorded for the mine site would likely remain undisturbed. However, none of the historic sites identified is considered a prehistoric or historic resource of National Register quality.

Lastly, the no action alternative of no mining project on the Mobil site would mean the approximately 77 million tons of phosphate matrix would not be recovered in the short term (the next 25 years). This non-renewable resource would accordingly be unavailable for fertilizer manufacture. Project termination would also result in a loss of considerable project investment by the company. While the 77 million tons of phosphate resource would not be recovered in the short term, they would remain as unmined phosphate reserves. With depletion of reserves and other restrictions reducing available supplies of phosphate rock, fertilizer supplies may become strategically important to the U.S. in the next century. Therefore, denial of the permit could mean that the site's phosphate would be conserved and retained as a national resource, while simultaneously appreciating in value to Mobil.

2.12.2 Postponement Of The Project

If EPA were to deny Mobil's NPDES permit application for the South Fort Meade Mine, the project might be postponed for an indefinite period of time and then successfully pursued by either Mobil or another mining company. This might be expected to occur when, as described above, high grade phosphate reserves are depleted and the resource retained on the South Fort Meade site becomes extremely valuable strategically as well as economically. An adverse effect resulting from postponement of the project would be the delay of socioeconomic benefits to the county and state in the form of jobs, payroll and taxes. Mobil would be adversely affected in that its capital investment could not be realized for an indefinite time.

On the other hand, important benefits could result from project postponement. Experimentation and research are ongoing in the areas of phosphate recovery efficiency, waste sand and clay disposal, reclamation, and wetlands restoration and creation. Technological advances could occur in these areas during the period of postponement which would allow an improved overall project.

2.12.3 Achieving A Zero Discharge

If EPA denies the NPDES permit, Mobil could still execute a mining project provided the project could be performed with zero discharge to surface waters. Under zero discharge conditions, neither an NPDES permit nor an Environmental Impact Statement would be required.

Achieving zero discharge would be extremely difficult, if not impossible, and would most likely require significantly increased surface impoundment for storage of water. The problems occurring with increased surface impoundment would include increased dike heights, probable infringement on presently designated preserved areas, a less desirable reclamation plan, and more limited post-reclamation land use potential.

It should be noted that although the EIS process would no longer be involved in scrutinizing these changes (should zero discharge be achieved), the applicant would still be subject to the state of Florida Development of Regional Impact (DRI) process as well as all applicable state and Federal permit requirements.

2.13 EPA'S PREFERRED ALTERNATIVES, MITIGATING MEASURES AND RECOMMENDED ACTION

The environmentally preferred alternative, EPA's preferred alternative, and Mobil's proposed action (including mitigating measures presented as part of the proposed action), all coincide with respect to the following project subsystems:

Mining Method (Dragline)
Matrix Transfer (Pipeline)
Processing (Conventional Beneficiation)
Water Sources (Groundwater Withdrawal)
Plant Siting (Gilshey Branch Site)
Water Discharge (Peace River)
Product Transport (Railroad)

Such is not the case for Mobil's proposed action for waste disposal and reclamation. The environmentally preferred alternatives and therefore the EPA preferred alternatives for waste disposal and reclamation are the sand/clay cap waste disposal case and the corresponding reclamation plan.

In addition to identifying the environmentally preferred alternatives, EPA's assessment has focused on developing mitigating measures, not already a part of the proposed action, which could minimize adverse impacts of the project. These are discussed in Section 2.11 of the DEIS. EPA has determined that the identified mitigation measures should be incorporated into the proposed project. Specifically, EPA recommends the following:

- Practice high-profile overburden stacking to the maximum extent compatible with toe spoiling of the leach zone.
- A program to reduce impacts on the indigo snake by capturing and relocating them to other suitable habitats in the region.

- A program to evaluate and reduce any potential impacts to the bald eagle nesting approximately 3/8 mile outside the mine site.
- A monitoring program to assess the wetlands restoration and re-creation effort at the mine site.
- A program to monitor the Shallow Aquifer to assess the effectiveness of the perimeter ditch in preventing dewatering of the preserved area.

In order to make its determination regarding the NPDES permit application for the Mobil project, EPA has developed a comparison between (1) Mobil's Proposed Action, (2) EPA's preferred alternatives and mitigating measures, and (3) the no action alternative of permit denial by EPA, which could lead to termination of the project or postponement of the project or modification of the project such that an NPDES permit would not be required (i.e. achieve zero discharge). This analysis is presented in Table 2.13-1.

After careful consideration of these alternatives, EPA proposes to issue an NPDES permit to Mobil for their proposed South Fort Meade Phosphate mine. The project authorized by the permit shall be the sum of EPA's preferred alternatives (which is Mobil's proposed action except in the case of waste disposal and reclamation). Further, the permit shall impose as permit conditions all the mitigation measures identified as part of Mobil's proposed action (Section 2.1 of the DEIS and Chapter 2 of the SID) as well as all the mitigating measures recommended by EPA.

TABLE 2.13-1

COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES

Discipline	Mobil's Proposed Action	EPA's Preferred Alternatives Including Mitigation Measures	The No Action Alternatives		
			Termination	Postponement	Achieve Zero Discharge
Air Quality, Meteorology, and Noise	Minor increases in fugitive dust emissions and emissions from internal combustion engines; minor emissions of volatile reagents; increased noise levels in the vicinity of operating equipment.	Same as Mobil's proposed action.	No change in meteorology & noise levels; possible air quality changes from other sources.	Same as Mobil's proposed action.	Same as Mobil's proposed action.
Geology and Soils	Disruption of the surface soils and overburden strata; removal of 77 million tons of phosphate rock; increased loading to the Hawthorn of 17 psi; altering of site topography; creation of approximately 7000 A of structurally and agronomically inferior land.	Same as Mobil's proposed action except: increased loading to Hawthorn Formation of 16 psi; alteration to topography not as great (2 ft. less); possible further decrease in level of CS-10; slightly increase future effort to recover phosphate from waste clay; improved structural and agronomic characteristics over the approximately 7000 A of land.	No change in geology; no change in site soils; preservation of 77 million tons of phosphate rock reserves.	Possible increased phosphate recovery and more effective waste disposal, reclamation, and wetlands restoration.	Increased dike heights and water storage capacity; infringement on Bowlegs Creek preserved area; less desirable reclamation plan.
Radiation	Disruption of the natural distribution of radioactive material within the overburden and matrix; increased gamma radiation levels from reclaimed surfaces and increased soil radioactivity.	Same as Mobil's proposed action, except that reclaimed surfaces would have lower overall soil radioactivity and gamma radiation levels.	No change in radiation characteristics of the site.	Same as Mobil's proposed action.	Probable increase in area covered with waste clays - the reclaimed material having the highest radioactivity levels.
Groundwater	Lowering of the piezometric surface of the Lower Floridan Aquifer; lowering of the Surficial Aquifer near active mine pits; 47 percent reduction in natural recharge.	Same as Mobil's proposed action, except that a perched water table would be established about 5 feet below the surface in the reclaimed sand/clay cap areas.	No change in existing groundwater quantity or quality.	Possible reduction in groundwater withdrawals because of more effective dewatering of waste materials resulting from future process development.	Possible reduction in groundwater withdrawals because of increased water storage.
Surface Water	Disruption of surface water flows from the mine site; minor alteration in flows following reclamation; degradation of water charges from the mine water system.	Same as Mobil's proposed action, except that dam failure potential is reduced because of decreased active settling areas and 2-foot lower dike heights.	No change in surface water quantity; surface water quality would be dependent upon future land uses in the area.	Same as Mobil's proposed action.	Eliminaton of surface water quality impacts resulting from discharge from mine water system; increased probability of dike failure impacts.
Biology	Destruction of aquatic and terrestrial habitats on the mine site; aquatic habitat modification due to reduced surface water flows and addition of contaminants; loss of some endangered species individuals; creation of modified habitats following reclamation.	Same as Mobil's proposed action, except 8 percent more wetlands would be reclaimed, improved soils for restoration of vegetation and habitats, and greater protection of listed species.	No change in existing aquatic or terrestrial ecology.	Possibly more effective reclamation.	Elimination of habitat modification resulting from mine water discharge; increased probability of dike failure impacts; probable increase in reclaimed land areas (waste clays) of limited use (pasture).
Human Resources	Retention of existing jobs and development of new jobs with comparatively high income; ad valorem and sales tax revenue for Polk County; severence tax revenue for the state Land Reclamation Trust Fund, and Florida Institute of Phosphate Research; maintain employment for Mobil's Fort Meade personnel.	Same as Mobil's proposed action, except land use potential improved by 4:1 sand/clay cap surface soil over clay settling areas.	Loss of jobs which would be generated by the project; loss of tax revenue for Polk County and the state; and a loss of Mobil's investment.	Potential increased project costs; loss of jobs.	Same as Mobil's proposed action.

3.0 THE AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

The proposed mining and processing of phosphate rock and subsequent reclamation of disturbed land would affect the existing conditions at the South Fort Meade site. This section presents the existing conditions of that environment as well as the environmental consequences of no action and of the alternative methods of accomplishing the project goals. The discussion is arranged by environmental discipline and mining subsystem (mining method, matrix transfer, etc.) so that the alternative methods for any given subsystem can be examined to an equal degree, thus providing a basis for comparison. Only those subsystems having impacts on a given discipline are discussed under the discipline heading.

The first alternative discussed under each discipline is the no action alternative, followed by Mobil's proposed action and other relevant alternatives. For the no action alternative, the assumption is that Mobil would not proceed with the construction and operation of the proposed mine, and the site would likely remain as it is in the foreseeable future. The site's phosphate reserves are a valuable resource, however, and may be sought through another proposed action by Mobil or some other phosphate company in the future.

The mining subsystems necessary for the South Fort Meade Mine are shown below. Alternatives for each subsystem are arranged with Mobil's proposed action first.

Mining Subsystem	Alternatives
Mining Method	Dragline Bucket Wheel Dredge
Matrix Transfer	Pipeline Conveyor Belt Truck

Mining Subsystem	Alternatives
Processing	Conventional Beneficiation Dry Separation
Waste Disposal	Conventional Clay Settling Case Sand/Clay Cap Case Sand/Clay Mix Case Overburden/Clay Mix Case
Reclamation	Conventional Plan Sand/Clay Cap Plan Sand/Clay Mix Plan Overburden/Clay Mix Plan
Water Sources	Groundwater Surface Water
Plant Siting	Gilshey Branch Site Other On-Site Locations
Water Discharge	Peace River Bowlegs Creek
Product Transport	Railroad Truck

3.1 METEOROLOGY, AIR QUALITY, AND NOISE

3.1.1 THE AFFECTED ENVIRONMENT

3.1.1.1 Meteorology and Climatology

The proposed South Fort Meade Mine site is located in the subtropical climate of the South Central District (as defined by the National Weather Service), which is characterized by hot, humid summers and mild winters. A summary of the climatological data for the area is shown in Table 3.1-1. Freezing seldom occurs more than once or twice each year with winter temperatures averaging about 62°F. During the summer months, the average temperature is typically 81°F. The normal annual rainfall is 53 to 54 inches, and is heaviest during the months of June through September. The area experiences about 100 thunderstorms each year with most occurring in the summer. Central Florida's humidity is moderate to high year-round, as would be expected in an area with high precipitation and subtropical temperatures. The humidity is usually highest at dawn (about 90 percent) and lowest in the early afternoon (about 55 percent).

TABLE 3.1-1

CLIMATOLOGICAL SUMMARY FOR LAKELAND, FLORIDA

	Jan. (Winter)	April (Spring)	July (Summer)	Oct. (Fall)	Annual	Period of Record
Temperature (^oF)						
Absolute maximum	85.0	95.0	101.0	89.0	86.0	1941-78
Mean maximum	70.5	81.8	90.4	82.4	81.3	1941-70
Mean	60.8	72.0	81.6	74.3	72.1	1941-70
Mean Minimum	51.0	62.1	72.7	66.1	62.9	1941-70
Absolute minimum	25.0	40.0	66.0	43.0	20.0	1941-78
Degree Days (65^oF)						
Heating	188.0	9.0	0.0	0.0	678.0	1941-70
Cooling	58.0	219.0	515.0	288.0	3298.0	1941-70
Normal Precipitation (in.)	2.32	2.57	8.09	2.84	49.43	1941-70
Relative Humidity (%) For Orlando (Lakeland Data Unavailable)						
Morning	87.0	87.0	90.0	87.0	88.0	1964-78
Afternoon	56.0	45.0	59.0	56.0	55.0	1964-78
Average Wind Speed (MPH)	7.3	7.7	5.7	7.2	6.9	1967-78
Miscellaneous (Mean Number of Days)						
Clear	10	11	2	12	100	1941-78
Partly Cloudy	12	12	18	11	159	1941-78
Cloudy	9	7	11	8	106	1941-78
Temperature 32^oF	1	0	0	0	2	1941-78
Precipitation 0.01 in.	7	6	18	8	120	1941-78

	Recurrence Interval					
	1 yr	5 yr	10 yr	25 yr	50 yr	100 yr
Maximum 24-hour Rainfall Intensity (inches)	4.0	6.5	7.5	9.0	10.0	11.0

SOURCE: NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Air movement over the South Central District is generally constant, with winds prevailing from the northeast and averaging six miles per hour during most of the year. Winter cold fronts may generate winds of 20 to 30 miles per hour, but the highest winds observed in the area are associated with tropical storms, hurricanes, or tornadoes. Florida typically experiences one or two tropical storms each year which usually approach the state from the east or southeast in August and September, shifting to the south or southwest in late September and October. Tornadoes may be spawned in association with tropical storms; however, they most frequently occur in the spring. Florida averages 10 to 15 tornadoes each year.

3.1.1.1.1 Dispersion Characteristics of the Local Atmosphere

The joint frequency distributions (calculated from STAR programs) for Orlando and Tampa, the stations nearest the site, were used to determine dispersion characteristics of the local atmosphere. Both stations' distributions show a prevailing wind direction from the north through the east. The Tampa data show that prevailing wind directions are primarily from the east-northeast through the east, one-fourth of the observations being from those directions. Mean wind speeds from both stations are similar, but Orlando reports a greater percentage of neutral stability conditions, reflecting its more inland weather regime. The high percentage of stable conditions reported by both stations is typical for regions in the southeastern United States. Stable conditions, when vertical disperson of pollutants is inhibited, will tend to increase the ground level pollutant concentrations originating from ground level sources while decreasing those from elevated sources.

The mixed layer, defined in terms of the mixing height, is the air space between ground level and a level aloft through which the atmospheric pollutants are distributed. The upper limit of the mixed layer is defined by a layer of relatively stable air which prevents or retards further vertical dispersion of pollutants. A low mixing height results in a decreased volume within which pollutants may be dispersed, causing potentially higher pollutant concentrations. Mixing heights for the Mobil site, determined by the Holzworth method (1972), were found to be moderate (500-700 meters morning and 1100-1600 meters afternoon). Thus, moderate mixing heights and almost constant wind give the central Florida area, where the South Fort Meade site is located, ventilation characteristics favorable to the rapid dilution of pollutants.

3.1.1.2 Air Quality

3.1.1.2.1 Air Pollution Control Regulations

There are both Federal and state regulations which may apply to air pollution control at the proposed South Fort Meade Mine site. Federal regulations include the following:

Ambient Air Quality Standards (40 CFR, Part 50). All sources of pollution must comply with Federal ambient air quality standards for sulfur dioxide, suspended particulate matter, nitrogen dioxide, ozone, hydrocarbons, and carbon monoxide. The Federal standards for pollutants of concern to the proposed mine are given in Table 3.1-2.

Prevention of Significant Deterioration (PSD) (Clean Air Act, Part C, 42 FR 5749, 42 FR 5741, 42 FR 57479). This regulation requires that state implementation plans (SIP's) be revised to include requirements which will prevent significant deterioration of air quality in areas which meet the ambient air quality standards (attainment areas). EPA issues the PSD permit if the state has not been granted this authority (Florida has not been granted authority). If the proposed new source has the potential to emit 250 tons per year of any pollutant regulated by the Clean Air Act, excluding fugitive emissions, then a PSD permit may be required before construction can commence. EPA has determined that a PSD permit is not required for the South Fort Meade Mine.

Applicable Florida regulations include the following:

Ambient Air Quality Standards (Florida Administrative Code (FAC), Chapter 17-2.06). All sources of air pollution must comply with Florida's ambient air

TABLE 3.1-2

AIR QUALITY STANDARDS FOR TSP AND SO_2 AND VEGETATIVE FLUORIDES STANDARD

Parameter	National(1)		Florida(2)
	Primary	Secondary	
TSP			
Annual geometric mean, ug/m^3	75	60	60
24-hour maximum concentration(3), ug/m^3	260	150	150
SO_2			
Annual arithmetic mean, ug/m^3	80	-	60
24-hour maximum concentration(3), ug/m^3	385	-	260
3-hour maximum concentration(3), ug/m^3	-	1300	1300
Vegetative Fluorides, ug/g	-	-	45

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(1) 40 CFR 50. Primary standards define the level of quality necessary to protect the public health. Secondary standards define the level which the EPA administrator judges necessary to protect public welfare, including the protection of sensitive vegetaion and other biota.

(2) FAC 17-2.

(3) Not to be exceeded more than once per year.

quality standards for sulfur dioxide, suspended particulate matter, nitrogen dioxide, ozone, hydrocarbons, and carbon monoxide. The Florida standards for pollutants of concern to the proposed mine are given in Table 3.1-2.

Best Available Control Technology (FAC, Chapter 17-2.03). All new sources must apply the best available control technology (BACT) to minimize emissions.

Fugitive Particulates (FAC, Chapter 17-2.05(3)). Reasonable precautions must be taken to prevent and minimize the emissions of fugitive particulate matter to the atmosphere.

Prevention of Significant Deterioration (FAC, Chapter 17-2.04). PSD is defined for major new emission sources. If the proposed mine were determined to be a major new emission source (250 tons per year of any pollutant regulated by the Clean Air Act), a PSD permit would be required. The Mobil South Fort Meade Mine will not require a PSD permit.

Permitting (FAC, Chapter 17-4.03). Any new stationary source must obtain a valid construction or operating permit before commencing such activities. This requires the completion of air pollutant source construction permit applications for each source.

3.1.1.2.2 Areawide Pollutants of Concern

A summary of both point and area sources of air pollution emissions for the seven counties in the region was presented in the Central Florida Phosphate Industry Areawide Impact Assessment Program (EPA, 1978). Hillsborough County point sources are dominated by the power industry, with the phosphate industry dominating point sources in Polk County. Emission sources in Manatee, Charlotte, DeSoto, Hardee and Sarasota Counties are relatively moderate to insignificant. The primary pollutants associated with the phosphate industry are total suspended particulates (TSP), sulfur dioxide (SO_2), insoluble fluorides and radon-222. These pollutants result from the following activities:

(1) Sulfur dioxide originates primarily from the burning of sulfur-containing fossil fuels and the manufacture of sulfuric acid from elemental sulfur (Pedco, 1976a and EPA, 1977).

(2) Dust is generated by fuel-burning, drying, grinding, and material transport, as well as by some stages of mining (Pedco, 1975, 1976a, 1976b).

(3) Fluorides arise from various chemical processes, drying and calcining, fluoride removal for feed preparation, and gypsum and cooling water ponds at chemical plants (ESE, 1977 and Tessitore, 1975, 1976).

(4) Radon-222 is the radioactive decay product of uranium-238 which is found in phosphate deposits. The disturbance of the ground formations by mining activities leads to a redistribution of the uranium and its decay products (Guimond and Windhame, 1975).

Site-specific data for TSP, SO_2 and fluorides are discussed below. Information on radon-222 is presented in Section 3.3.1 (Radiation, The Affected Environment).

Total Suspended Particulates: Five high volume air samplers were operated at the South Fort Meade site from February 14, 1979, to February 27, 1980, in order to establish the baseline levels of total suspended particulates (TSP). During this one-year period, 558 observations were made and all measured concentrations of TSP were well below the Florida and Federal ambient air quality standards (Table 3.1-2). The maximum 24-hour concentration of 72 ug/m^3 was measured between June 26 and July 2, 1979. This value is below Florida's 24-hour maximum standard (150 ug/m^3) as well as the national primary 24-hour maximum standard (260 ug/m^3). The annual geometric mean was 29 ug/m^3, approximately 50 percent of Florida's TSP annual standard of 60 ug/m^3 and about 40 percent of the national primary standard of 75 ug/m^3.

The TSP data collected at the South Fort Meade Mine site compare favorably with the data discussed in the Central Florida Phosphate Industry Areawide EIS (EPA, 1978), closely approximating the values measured in undeveloped areas. Thus, the baseline TSP concentration measured at the proposed mine site can be considered representative of typical undeveloped areas in central Florida and demonstrates that the location is attaining the state and Federal air quality standards for this pollutant.

Sulfur Dioxide: A Thermo Electron Model 43 continuous SO_2 analyzer was operated at the proposed mine site from June 13, 1979, to February 29, 1980, to provide background data on SO_2 concentrations. Out of the 11,336 observations, none of the measured concentrations of SO_2 exceeded at any time the Florida or national standards (Table 3.1-2). The annual mean SO_2 concentration of 6.56 ug/m^3 at the site is approximately 10 percent of the Florida annual standard (60 ug/m^3) and 8 percent of the national annual standard (80 ug/m^3). The South Fort Meade Mine SO_2 data are also similar to the data reported for undeveloped areas (EPA, 1978).

Fluorides: Four sets of vegetation samples from the area surrounding the proposed mine site were analyzed for vegetative fluorides. A total of 24 samples were collected of pasture grass and citrus leaves and six soil samples were collected from pasture and citrus areas. None of the vegetative samples or soil samples exceeded the Florida fluoride standard (Table 3.1-2). The maximum fluoride level measured at the site was 39.6 ug/g (pasture grass), or 88 percent of the Florida standard of 45 ug/g. The average level for the vegetative samples was 11.5 ug/g, about 25 percent of the standard and far below those levels reported for Polk County by EPA (1978). The high fluoride levels reported by EPA are concentrated about 10 miles north of the proposed mine site. EPA also reported a tendency toward a decrease in size of those areas exceeding the 45 ug/g limit, due to better control of fluoride emissions. If the trend toward lower vegetative fluoride levels continues, lower concentrations at the South Fort Meade Mine site would be expected in the future.

3.1.1.3 Noise

Day, evening and nighttime noise measurements were taken at six monitoring stations on the site between April 13 and 14, 1980 (Table 3.1-3). The equivalent A-weighted sound levels (L_{eq}) on the site ranged from 37 to 51 dBA, while the equivalent day/night A-weighted sound levels (L_{dn}) ranged from 48 to 55 dBA. These values are at the upper expected range for a rural area. During the nighttime sampling events, there were no significant differences

TABLE 3.1-3

NOISE SURVEY RESULTS AT SOUTH FORT MEADE SITE

Monitoring Station (see below)	April 13, 1980 (Sunday) L_{eq} (dBA)			L_{dn} (dBA)	April 14, 1980 (Monday) L_{eq} (dBA)			L_{dn} (dBA)
	Night (Sat/Sun)	Day (Sun)	Evening (Sun)		Night (Sun/Mon)	Day (Mon)	Evening (Mon)	
1	49	47	41	55	49	37	41	55
2	47	45	45	53	47	37	41	53
3	46	45	49	52	47	39	43	53
4	42	51	39	48	43	44	49	50
5	39	49	41	49	47	37	34	53
6	45	49	48	52	47	36	36	53

Station No.	Description
1	Approximately 600 feet south of the end of the southernmost curve in Mt. Pisgah Road. Microphone was even with first row of orange trees approximately 75 feet from the edge of the pavement. Station was surrounded by orange groves.
2	Even with the first row of orange trees on the south side of Mt. Pisgah Baptist Church; approximately 150 feet from the roadway, surrounded by orange groves.
3	Northeast corner of the intersection of Mt. Pisgah Road and County Line Road. Approximately 50 feet and 100 feet from the respective roadways. Station was one-fourth encompassed by orange groves and three-fourths by fields, pasture and woods.
4	Approximately 200 feet north of County Line Road on Manley Road, surrounded by field and pasture.
5	Three-fourths mile south of Keller Road on gravel road. Area surrounded by orange groves, fields, pasture and woods.
6	2,000 feet north of Keller Road on paved road between Sections 14 and 15. Microphone was approximately 10 feet from the pavement, adjacent to barbed wire fence, surrounded by field and pasture.

Notes:

(L_{eq}) The A-weighted average sound level, in decibels, during a designated time period.

(L_{dn}) The A-weighted average sound level, in decibels, during a 24-hour period with a 10-decibel weight applied to the nighttime sound levels from 10 p.m. to 7 a.m.

SOURCE: STUDY DATA

between sound levels recorded on a weekend night versus a weekday night except at Station 5, the remotest sampling location, where the weekday night sample L_{eq} was 8 dBA higher. Variations in the observed nighttime noise levels at such a remote location are probably due to natural phenomena (wind, insect activity, etc.). The weekend and weekday L_{eq} values for the daytime and evening sampling periods demonstrated no discernible patterns of variation.

3.1.2 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

3.1.2.1 The No Action Alternative

The no action alternative would not increase air emissions or noise levels, and the site's air quality and noise characteristics would likely remain as they currently are. However, emissions from any new sources in the area permitted in the future and/or changes in fuels used at existing sources may change the air quality of the South Fort Meade site.

3.1.2.2 The Action Alternatives Including the Proposed Action

3.1.2.2.1 Mining Method Alternatives

Dragline (Mobil's Proposed Action): The electrically powered draglines would not generate point source combustion emissions of air pollutants. Small quantities of fugitive dust may be generated during overburden removal and matrix extraction, but because these mined materials would be generally wet, dust emissions would occur only in isolated cases when surface areas become dry. Vehicular traffic from operations and maintenance personnel on roadways in the mining area would constitute line sources of air pollutant emissions consisting of carbon monoxide (CO), nitrogen oxides (NO_x) and hydrocarbons. Ground level emissions of fugitive dust would also be generated by this traffic flow. These impacts would be insignificant since the emissions would be intermittent and would be confined primarily to the proposed mine site.

The mining method requires that 50-acre parcels be cleared ahead of each dragline, which would result in fugitive dust and emissions of particulates, CO, and hydrocarbons from open burning of vegetative debris. Approximately 30 percent of the total land area at the site (4,500 acres) has vegetation requiring clearing and disposal. The impact of this clearing would be minimal because the emissions would be intermittent and the rural setting would allow for the rapid dispersion of pollutants. All burning activity connected with land clearing would be regulated by permits from the state.

According to the results of the noise monitoring program conducted as part of Estech's environmental assessment (EPA, 1979a), noise levels between 55 and 62 dBA are expected at a distance of 200 feet from an operating electric dragline. Under a "worst case" situation (highest recorded sound level on site and the highest noise level for an operating dragline) an L_{dn} value of 68 dBA could occur at the South Fort Meade Mine property line. This maximum noise level is greater than the U.S. Department of Housing and Urban Development's (HUD) normally unacceptable threshold of 65 dBA, but less than HUD's unacceptable level of 75 dBA. The maximum value is expected to occur off site only if the dragline is operating 200 feet or less from the property line. Traffic associated with the construction and operation of the mine would not significantly affect the existing noise environment.

Bucket Wheel: The bucket wheel, like the dragline, would be electrically powered and would not generate point source combustion emissions. However, the potential for fugitive dust emissions associated with this method would be greater than with dragline operations since the drier pit conditions required favor increased wind erosion of the soil. Bucket wheel mining would also require a larger cleared area than the dragline method, further increasing fugitive dust emissions. Open burning of vegetation would generate emissions in approximately the same quantities as the dragline operation. Mining with a bucket wheel would require additional handling of the overburden through conveyors which could potentially increase fugitive dust and would generate greater noise levels than the dragline mining method.

Dredge: The electrically powered dredge would not generate point source combustion emissions of air pollutants. Fugitive dust emissions would be negligible since excavation is done underwater and overburden and matrix are moved as slurry. Potential dust emissions would be further reduced by the flooding of the cleared acreage. Open burning of vegetation would generate emissions in approximately the same quantities as the dragline operation. Mining by dredge would affect noise levels in the same way as the dragline method.

3.1.2.2.2 Matrix Transfer Alternatives

Pipeline (Mobil's Proposed Action): No fugitive dust emissions would be associated with the pipeline transfer of wet slurry. Because the slurry pumps would be driven by electric motors, pumping would not result in any point source emissions at the site. The electric booster pumps would be the only source of noise associated with this matrix transfer system. The noise generated by the pumps would not contribute to the off-site noise environment for three reasons: (1) the pumps would be widely spaced along the pipeline route, (2) the pipeline route itself would be away from the property boundaries, and (3) the pump stations would be low noise generation sources. A peak sound pressure level of 68 dBA for the combination of a dragline and slurry pit pipeline has been measured (EPA, 1979a).

Conveyor Transport: The potential exists for minor fugitive dust emissions from the conveyor operation since the surface material could dry at times during transfer. Unless the conveyor is contained or covered, fugitive dust emissions would occur along the transport corridor. A conveyor system would generally be noisier than a pipeline system. Based on a recent study, L_{dn} levels on the order of 70 dBA could occur at a distance of 175 feet from an operating conveyor (Farmlands, 1981). The principal source of noise from a conveyor system is the movement of the belts and rollers, generating noise along the entire length of the conveyor route. Since the route of the conveyor system would be away from the property boundaries, the off-site exposure to conveyor system noise should be minimal. Levels on the order of 60 dBA would occur at 1,250 feet.

Truck: Several potential sources of air pollution are associated with this transfer method. The trucks' engines would exhaust NO_x, CO, hydrocarbons and particulate matter during transit as well as during idling periods while waiting to be loaded. Emissions of fugitive particulate matter would be generated throughout the entire transfer process (truck loading by the dragline, vehicular traffic on the haul roads, erosion losses during open-bed truck transport and truck dumping at the ultimate destination). The continuous construction of haul roads to accommodate this transfer method would further increase the generation of fugitive dust.

The trucks required to move the ore from the mining area to the beneficiation plant would generate greater noise levels than the other transfer methods. The magnitude of such noise would depend on the location of the mining area and the truck transport route. The impact would be greatest during nighttime hours. Currently there is little truck-generated noise on local roads during nighttime hours.

3.1.2.2.3 Matrix Processing Alternatives

Conventional Beneficiation (Mobil's Proposed Action): None of the component operations of conventional beneficiation are considered to be major air pollution sources. There are no combustion sources and no drying processes that involve the blowing of air through product or waste material. Wind erosion losses from product dumping into rail cars or pebble storage piles may result in minor amounts of fugitive dust emissions; however, the use of water as a transfer medium and the moist nature of the product would prevent fugitive dust from becoming a problem. The impact of the dust generated would be negligible by the time it reaches Mobil's property boundary.

Transfer and storage of some of the flotation reagents could result in emissions of volatile organic compounds (VOC). For example, when a kerosene tank is filled, vapor in the tank headspace would be vented to the atmosphere. Similar emissions are also possible from storage and transfer of fatty acids, amines and No. 5 fuel oil. These potential emissions would be quite small, however, due to the low vapor pressures of the materials stored on site.

Based on the Estech study, the conventional beneficiation plant is expected to generate noise levels between 70 and 75 dBA at a distance of approximately 200 feet. The property boundary nearest the beneficiation plant is approximately 3,300 feet away. Noise generated by the operation of the plant would be attenuated to between 46 and 51 dBA over that distance, not considering the additional attenuating characteristics of groundcover, foliage, and man-made or natural barriers. Therefore, the contribution of the conventional beneficiation plant to the off-site noise environment will not affect even the nearest potential receptor.

Dry Separation: The dry separation process would create a significant source of air pollutant emissions as a result of drying large quantities of matrix which would require combustion of substantial volumes of fuel oil. Combustion of the fuel oil would generate emissions of SO_2 dependent on the sulfur content of the fuel. Some fuel oils are characterized by relatively high concentrations of vanadium (approximately 200 ppm) which act to catalyze the formation of sulfuric acid from SO_2. The dry separation process thus poses the added potential for emissions of acid mist, with the attendant plumes of high opacity. Particulate matter entrained in the dryer exhaust gases would have to be removed before discharge to the atmosphere. Oxides of nitrogen (NO_x) emissions are a major concern from any combustion-related drying process.

The dry separation process requires the use of dry mining matrix transfer methods which increases the fugitive dust impacts. The crushing and sizing operations required prior to drying would generate large amounts of fugitive dust. Blowers used to separate the matrix would add to the levels of TSP near the plant site.

This beneficiation process has three components that would have high noise generation potential: a pulverizer, a rotary kiln with a firebox, and an air fluidized-bed separator. The dry separation process would be noisier than the conventional beneficiation process; however, it is improbable that off-site noise levels would reach unacceptable levels.

3.1.2.2.4 Waste Disposal and Reclamation Alternatives

Conventional Clay Settling (Mobil's Proposed Action): Earthmoving operations would generate fugitive dust and combustion emissions as impoundments are built, land is leveled and topography is restored. Nine pieces of earthmoving equipment are projected to be used at the South Fort Meade Mine. Their emissions and associated fugitive dust would rapidly disperse over the open mine site, resulting in a negligible impact. During the period between mining and reclamation of any given area, the barren landscape may give rise to fugitive dust emissions. The maximum size of this area is estimated to be 745 acres during Phase II with two working draglines. After one year, revegetation of the barren areas will occur through natural seeding, providing temporary cover until reclamation and revegetation.

Mobil proposes to use six scrapers, two bulldozers and one grader, each with a peak noise level at 50 feet of 87 dBA, 86 dBA, and 84 dBA, respectively. Using a noise prediction methodology developed by the Federal Highway Administration for heavy equipment operation, day-night equivalent noise levels adjacent to dam construction areas will increase while such activities are in progress. Earthmoving equipment for dam construction would normally be operated during the daytime for 8 to 10 hours each weekday. Dam construction is not expected to occur any closer than 200 feet from any receptor. During a dam construction period, therefore, equivalent noise levels 200 feet from a dam construction site will be approximately 75 dBA, assuming no attenuation due to groundcover, foliage and man-made or natural barriers. At various locations adjacent to the site, L_{dn} values will exceed 65 dBA, a level considered by the U.S. Department of Housing and Urban Development (HUD) to be "normally unacceptable". However, dam construction activities will not cause L_{dn} values to exceed 75 dBA, HUD's "unacceptable" level. After completion of a dam wall, noise levels on adjacent properties will return to preconstruction levels because the dam walls will, in effect, serve as a sound barrier to subsequent mine-related noises. The short-term noise impact of waste disposal and reclamation activities could be significant for several weeks to nearby residents. The impacts would be intermittent, however, occurring only during daylight hours. The long-term noise impact will be negligible.

Sand/Clay Cap: This alternative would have approximately the same air and noise impacts as the conventional clay settling case.

Sand/Clay Mix: This alternative would have the same impacts on the air resources and noise environment as the conventional clay settling case.

Overburden/Clay Mix: Impacts on the air resources and noise levels would be greater with this method than the conventional case because of the additional earthmoving equipment and mixers required.

3.1.2.2.5 Plant Siting Alternatives

Gilshey Branch (Mobil's Proposed Action): The proposed Gilshey Branch plant is located at the centroid of pumping distances for the proposed mine site and adjacent to an existing road which would provide easy access to the processing plant (Figure 1.0-B). The minor emissions from conventional processing would not carry beyond the site's boundaries. The location of the plant would have little or no impact on the noise environment of adjacent off-site property.

Other On-Site Locations: Other on-site plant locations are not expected to substantially change the emissions from the plant itself, although increased vehicle traffic miles created by additional travel distances would result in greater quantities of roadway dust and vehicular emissions. Moving the plant site closer to the property boundaries would increase the impacts on adjacent properties.

3.1.2.2.6 Product Transport Alternatives

Railroad (Mobil's Proposed Action): Mobil proposes to transport product on a new, six-mile railroad spur constructed from the beneficiation plant to the main railroad line west of the mine site (Figure 2.1-I). The train would make two daily round trips. The nearest residence to the track alignment is 405 feet north of the track with the next closest residence 820 feet south of the track. Based on the "Noise Assessment Guidelines" prepared by HUD, neither residence location will have an L_{dn} greater than 55 dBA due to the operation of the railroad. This value is well below HUD's "normally unacceptable" level of 65 dBA. The train would emit air pollutants associated with fuel combustion (particulates, NO_x, CO and hydrocarbons), but these emissions would have a minor effect on local air quality.

Truck: Approximately 260 truck trips would be needed to transport the 6,500 tons of product carried by one train. The trucks would use about six times the energy required for rail transport and would result in a significant increase in emissions of air pollutants. If all the trucks use State Route 664 to enter and exit the mine site, the traffic-generated noise levels along the road segment between Mt. Pisgah Road and U.S. 17 would increase above the maximum recorded L_{dn} value of 55 dBA (Table 3.1-3). During the first phase of operation, L_{dn} values would be 65 to 66 dBA 100 feet from the roadway. During the second phase of mine operation, after mine production has doubled, the L_{dn} value at the same distance from the roadway would rise to 70 dBA.

3.2 GEOLOGY AND SOILS

3.2.1 THE AFFECTED ENVIRONMENT

3.2.1.1 Geology

Geomorphology: The proposed South Fort Meade Mine site lies in the Central Highlands division of the Mid-Peninsular Physiographic Zone. The Polk Upland, where the proposed mine is located, is a subdivision within the Central Highlands. The ground-surface elevation of the upland generally ranges between 100 and 130 feet above mean sea level. The predominant structural feature affecting the area of interest is the Ocala Arch, a regional anticline (geologic fold) that follows a northwest-southeast line beginning in Dixie County and extending southward into northeastern Polk County.

Stratigraphy: During the well-drilling program conducted at the proposed mine site, geologic formations ranging in age from Eocene to Recent were penetrated. Beginning with the oldest, the formations are as follows: the Lake City Limestone, Avon Park Limestone, and the Ocala Group of Eocene age; the Suwannee Limestone of Oligocene age; the Tampa Formation and Hawthorn Formation of Miocene age; and undifferentiated clastics ranging in age from middle Miocene to Recent. A stratigraphic section of the proposed mine site is presented in Figure 3.2-A.

Solution Features: Karst topography has developed in large portions of northern and central Florida, and an elongate zone of sinkholes penetrates the upper geologic units and extends from north-central Florida to the south central portion of the state, corresponding to the numerous Central Highlands ridges. The proposed mine site is located approximately 12 miles west of the closest occurrence of the sinkhole zone in Polk County. The site's topography (as well as most of the Polk Upland) is due primarily to the erosional effects of surface water rather than sinkhole development.

FIGURE 3.2-A

STRATIGRAPHIC SECTION OF THE PROPOSED MINE SITE

SYSTEM	SERIES	STRATIGRAPHIC UNIT		APPROXIMATE THICKNESS (FEET)	AVERAGE DEPTH IN FEET BELOW LAND SURFACE
QUARTERNARY and TERTIARY	RECENT, PLEISTOCENE, PLIOCENE and MIOCENE	UNDIFFERENTIATED CLASTICS		45	45
TERTIARY	MIOCENE	HAWTHORN FORMATION		80	125
		TAMPA FORMATION	LIMESTONE UNIT	105	
			SAND & CLAY UNIT	70	300
	OLIGOCENE	SUWANNEE LIMESTONE		90	390
	EOCENE	OCALA GROUP	CRYSTAL RIVER FORMATION	340	
			WILLISTON FORMATION		
			INGLIS FORMATION		730
		AVON PARK LIMESTONE	LIMESTONE UNIT	275	
			DOLOMITE UNIT	160	
			LIMESTONE UNIT	240	1405
		LAKE CITY LIMESTONE			

SOURCE: STUDY DATA

The potential for subsidence as a result of mining-induced solution activity in the area is considered unlikely due to the thickness of clastic units overlying solution-susceptible units and the relatively stable and uniformly high water level elevations. Solution or collapse features are not known to exist near the proposed mine.

Proposed Mine Site Geology: The ore bearing zones, contained in the lower section of the undifferentiated clastics, consist of a sandy clay matrix interlayered with phosphate pebbles. This lower section averages 25 feet thick and is generally overlain by some 20 feet of sandy overburden. The typical mine excavation would extend approximately 45 feet below present ground surface, terminating at the clay bed overlying the Hawthorn Formation. (See also Section 3.3 for discussion of the association of radioactive elements with the phosphate deposits.)

3.2.1.2 Soils

The Soil Conservation Service (SCS) has been compiling extensive information on the soils in Central Florida and was commissioned to conduct the soils survey for the proposed South Fort Meade Mine site. The SCS determined that the soils on the site are typical of those throughout the region. In addition, core samples were collected at six locations on the site in order to characterize the near-surface soils and project the engineering and agronomic properties of the reclaimed surface materials. The analyses of the core samples are presented in Table 3.2-1. The surface soils (0 to 1 foot) were found to be generally very sandy (94.7 to 98.7 percent), acidic (pH 4.2 to 6.4) and low in plant available nutrients.

Soil Series: A total of 34 soil series were found on the site (Figure 3.2-B). Total acreage and relative percentages of each specific soil series are tabulated in Table 3.2-2. Dominant soils include Pomona Fine Sand (3,327 acres), Myakka Fine Sand (3,144 acres), Ona Fine Sand (1,503 acres) and Zolfo Fine Sand (1,732 acres). Collectively, these four soil series account for 56 percent of the 17,355 acres mapped.

TABLE 3.2-1

PARTICLE SIZE DISTRIBUTION AND PLANT AVAILABLE NUTRIENT ANALYSES OF OVERBURDEN, SAND TAILINGS AND PHOSPHATIC CLAY SAMPLES

Core Sample	Sample	Particle Size Distribution			pH	Plant Available Nutrients (lb/acre)*			
		% Sand	% Silt	% Clay		Ca	Mg	P	K
R-3	0-1' Overburden	98.75	0.50	0.75	4.2	56	10	120	27
	1-15' Overburden	96.75	1.00	2.25	6.7	872	103	1,600	14
	15-16' Overburden	92.25	2.50	5.25	6.2	2,128	205	3,720	57
	+35 Mesh Sand Tailings	97.50	0.00	2.50	8.5	7,320	1,572	1,890	8
	-35 Mesh Sand Tailings	98.75	0.00	1.25	7.4	6,560	712	2,370	7
	Phosphatic Clay	**	**	**	**	**	**	**	**
R-6	0-1' Overburden	96.50	1.50	2.00	5.4	312	25	47	25
	1-15' Overburden	94.00	1.50	4.50	5.4	104	55	400	20
	15-23' Overburden	74.50	2.00	23.50	6.3	1,456	784	2,650	133
	+35 Mesh Sand Tailings	98.25	0.00	1.75	6.7	6,520	120	2,300	7
	-35 Mesh Sand Tailings	97.00	0.00	3.00	6.7	7,800	112	3,670	8
	Phosphatic Clay	40.00	7.50	52.50	7.1	7,080	1,728	1,330	492
R-7	0-2' Overburden	96.75	1.50	1.75	5.6	168	48	155	67
	2-3.5' Overburden	94.50	3.00	2.50	5.1	32	9	128	53
	3.5-8' Overburden	95.50	2.00	2.50	5.2	16	12	108	30
	8-12' Overburden	94.00	4.50	1.50	5.3	40	23	234	16
	12-12.5' Overburden	96.75	2.75	0.50	5.1	8	4	296	5
	12.5-21' Overburden	82.50	1.75	15.75	5.0	32	166	128	19
	21-25.5' Overburden	84.50	2.25	13.25	6.0	792	305	930	55
	+35 Mesh Sand Tailings	98.25	0.00	1.75	6.8	6,720	116	3,110	8
	-35 Mesh Sand Tailings	98.50	0.00	1.50	6.5	6,840	68	2,800	7
	Phosphatic Clay	33.75	2.00	64.25	7.0	6,680	1,468	1,330	308

TABLE 3.2-1 (Continued)

Core Sample	Sample	Particle Size Distribution % Sand	% Silt	% Clay	pH	Plant Available Nutrients (lb/acre)* Ca	Mg	P	K
R-9	0-2' Overburden	96.50	2.50	1.00	5.3	80	31	100	24
	2-4.5' Overburden	96.25	3.00	0.75	5.0	24	19	44	7
	4.5-7.5' Overburden	97.75	1.75	0.50	5.4	72	12	87	15
	7.5-12.5' Overburden	93.75	2.75	3.50	5.2	56	23	64	21
	+35 Mesh Sand Tailings	97.50	0.00	2.50	6.5	6,390	148	2,300	4
	-35 Mesh Sand Tailings	97.75	0.00	2.25	6.8	7,760	108	3,020	7
	Phosphatic Clay	23.75	11.00	65.25	7.3	5,000	1,448	280	148
R-10	0-0.5' Overburden	94.75	4.25	1.00	6.4	1,568	412	474	113
	0.5-2' Overburden	94.75	2.25	3.00	6.0	184	80	220	50
	2-15' Overburden	92.50	1.25	6.25	5.3	568	86	930	25
	15-20' Overburden	79.75	0.25	20.00	5.5	2,072	229	3,720	104
	+35 Mesh Sand Tailings	97.25	0.00	2.75	6.3	6,320	88	2,950	6
	-35 Mesh Sand Tailings	97.25	0.00	2.75	6.4	7,480	72	3,110	4
	Phosphatic Clay	35.00	9.00	56.00	7.0	6,520	1,260	1,100	164
R-11	0-1' Overburden	95.50	2.50	2.00	6.2	408	66	100	48
	1-7.5' Overburden	93.25	1.75	5.00	5.3	32	25	32	17
	7.5-17' Overburden	79.00	1.25	19.75	5.0	88	122	24	18
	17-22' Overburden	82.00	3.00	15.00	5.0	96	121	43	56
	+35 Mesh Sand Tailings	98.50	0.00	1.50	6.9	5,480	76	1,830	6
	-35 Mesh Sand Tailings	97.75	0.00	2.25	6.3	6,800	80	2,190	6
	Phosphatic Clay	35.00	7.00	58.00	6.6	6,560	1,532	1,720	300

Ca - Calcium
Mg - Magnesium
P - Phosphorus
K - Potassium

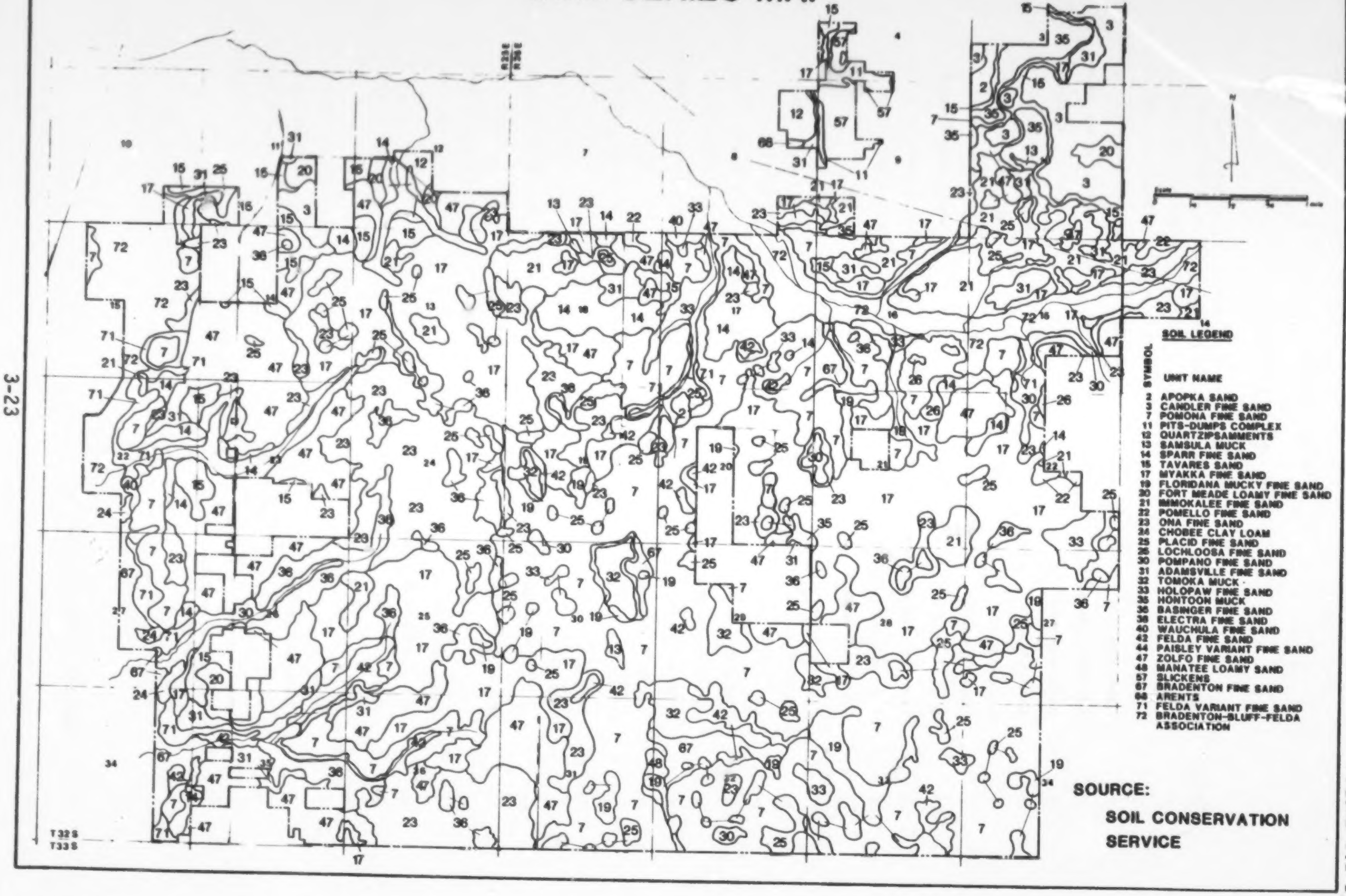
* 0.05 N HCl in 0.025 N H_2O_5 used as the extracting solution

** Sample lost

SOURCE: ZELLARS-WILLIAMS

FIGURE 3.2-B

SOIL SERIES MAP



SOIL LEGEND

SYMBOL	UNIT NAME
2	APOPKA SAND
3	CANDLER FINE SAND
7	POMONA FINE SAND
11	PITS-DUMPS COMPLEX
12	QUARTZIPSAMMENTS
13	SAMSULA MUCK
14	SPARR FINE SAND
15	TAVARES SAND
17	MYAKKA FINE SAND
19	FLORIDANA MUCKY FINE SAND
20	FORT MEADE LOAMY FINE SAND
21	IMMOKALEE FINE SAND
22	POMELLO FINE SAND
23	ONA FINE SAND
24	CHOBEE CLAY LOAM
25	PLACID FINE SAND
26	LOCHLOOSA FINE SAND
30	POMPANO FINE SAND
31	ADAMSVILLE FINE SAND
32	TOMOKA MUCK
33	HOLOPAW FINE SAND
35	HONTOON MUCK
36	BASINGER FINE SAND
38	ELECTRA FINE SAND
40	WAUCHULA FINE SAND
42	FELDA FINE SAND
44	PAISLEY VARIANT FINE SAND
47	ZOLFO FINE SAND
48	MANATEE LOAMY SAND
57	SLICKENS
67	BRADENTON FINE SAND
68	ARENTS
71	FELDA VARIANT FINE SAND
72	BRADENTON-BLUFF-FELDA ASSOCIATION

SOURCE:
SOIL CONSERVATION SERVICE

TABLE 3.2-2

SOIL DISTRIBUTION

Map Symbol	Mapping Unit Name	Number of Acres	% Of Total Mapped	Topographical Features
2	Apopka Series	92	0.5	Well drained upland
3	Candler Fine Sand	603	3.5	Well drained upland
7	Pomona Fine Sand	3327	19.2	Nearly level flatwoods
11	Pits-Dumps Complex	76	0.4	Phosphate mine related
12	Quartzipsamments	68	0.4	Phosphate mine related
13	Samsula Muck	41	0.2	Depressional organic soils
14	Sparr Fine Sand	470	2.7	Poorly drained upland
15	Tavares Sand	596	3.4	Well drained upland
17	Myakka Fine Sand	3144	18.1	Nearly level flatwoods
19	Floridana Mucky Fine Sand	363	2.1	Depressional soils
20	Fort Meade Loamy Fine Sand	201	1.2	Well drained upland
21	Immokalee Fine Sand	680	3.9	Nearly level flatwoods
22	Pomello Fine Sand	36	0.2	Upland flatwoods
23	Ona Fine Sand	1503	8.7	Nearly level flatwoods
24	Chobee Clay Loam	34	0.2	Floodplain
25	Placid Fine Sand	555	3.2	Nearly level flatwoods
26	Lochloosa Fine Sand	43	0.2	Poorly drained upland
30	Pompano Fine Sand	188	1.1	Flatwoods and floodplain
31	Adamsville Fine Sand	350	2.0	Upland flatwoods
32	Tomoka Muck	286	1.6	Depressional organic soils
33	Holopaw Fine Sand	248	1.4	Floodplains and flatwoods
35	Hontoon Muck	152	0.9	Depressional organic soils
36	Basinger Fine Sand	500	2.9	Nearly level flatwoods
38	Electra Fine Sand	3	<0.05	Upland flatwoods
40	Wauchula Fine Sand	23	0.1	Nearly level flatwoods
42	Felda Fine Sand	544	3.1	Floodplains and flatwoods
44	Paisley Variant Fine Sand	3	<0.05	Floodplains
47	Zolfo Fine Sand	1732	10.0	Somewhat poorly drained upland
48	Manatee Loamy Fine Sand	19	0.1	Depressional soils
57	Slickens	194	1.1	Phosphate mine related
67	Bradenton Fine Sand	277	1.6	Floodplains and flatwoods
68	Arents	35	0.2	Phosphate mine related
71	Felda Variant Fine Sand	248	1.4	Floodplains and flatwoods
72	Bradenton-Bluff-Felda Association	721	4.1	Floodplains
TOTAL		17,355*	99.7	

* Includes outparcels located within the site

SOURCE: POLK COUNTY SCS

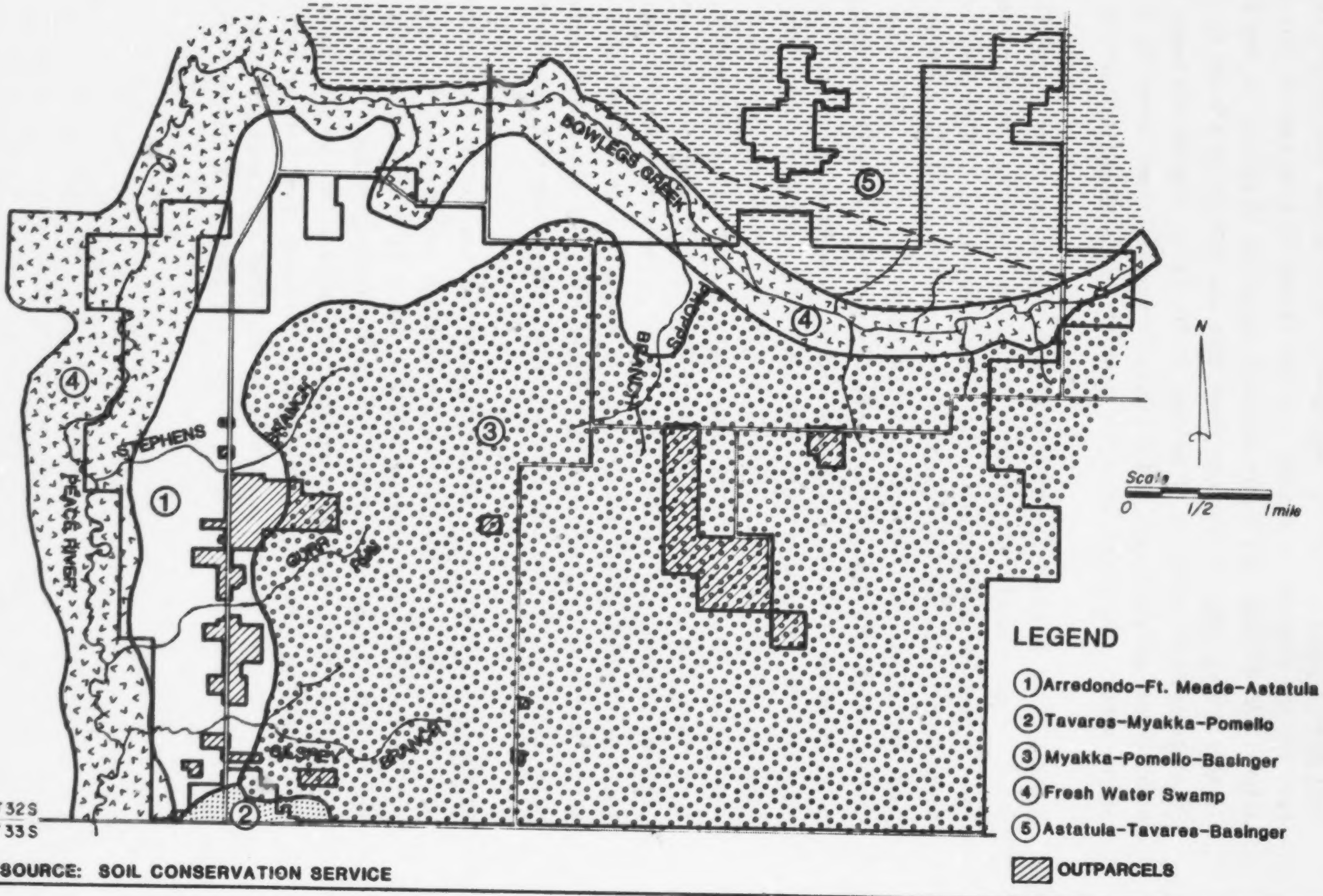
Soil Associations: A general county-wide study by the SCS grouped the soils covering the proposed mine site into the following five general soil associations: Arrendondo-Fort Meade-Astatula (covering 13 percent of the site), Tavares-Myakka-Pomello (covering less than one percent of the site), Myakka-Pomello-Basinger (covering 67 percent of the site), Freshwater Swamp (covering nine percent of the site), and Astatula-Tavares-Basinger (covering 11 percent of the site). The extent of these associations is shown in Figure 3.2-C.

A description of the properties of each soil association is listed in Table 3.2-3. Approximately 76 percent of the project site is covered by the Myakka-Pomello-Basinger and Freshwater Swamp soil associations which have severe foundation limitations for construction of buildings or light industry. The remaining areas have slight to moderate foundation limitations. The Arrendondo-Fort Meade-Astatula and the Myakka-Pomello-Basinger soil associations comprise 80 percent of the site. Land within these associations has a high potential for improved pasture. The land within the Arrendondo-Fort Meade-Astatula and the Astatula-Tavares-Basinger soil associations has a high potential for citrus production. With the exception of the Freshwater Swamp soil association, most of the land on the site is a sandy material which has a high percolation rate and is a poor topsoil. The Arrendondo-Fort Meade-Astatula, Tavares-Myakka-Pomello, and Astatula-Tavares-Basinger soil associations are droughty areas while the Myakka-Pomello-Basinger and Freshwater Swamp soil associations are chacterized by damp to wet soil conditions.

Unique Agricultural Land: Unique farmland has the special combination of soil quality, location, growing season and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods (7CFR Part 657). There are no designated prime agricultural soils on the proposed mine site due to the lack of fertility, organic composition and other soil properties required for this category. There are 566 acres of orange groves on the proposed mine site, of which 446 acres are classified as unique citrus lands.

FIGURE 3.2-C

SOIL ASSOCIATION MAP


BOWLEGS CREEK
PROPPS BRANCH
STEPHENS BRANCH
PEACE RIVER
OSPREY BRANCH
①
②
③
④
⑤
N
Scale
0
1/2
1 mile
T32S
T33S
LEGEND
① Arredondo-Ft. Meade-Astatula
② Tavares-Myakka-Pomello
③ Myakka-Pomello-Basinger
④ Fresh Water Swamp
⑤ Astatula-Tavares-Basinger
▨ OUTPARCELS

SOURCE: SOIL CONSERVATION SERVICE

TABLE 3.2-3

SOIL RATINGS, LIMITATIONS AND FEATURES AFFECTING SELECTED USES BY SOIL ASSOCIATION

Soil Association[a,b]	Map Symbol (Figure 3.2-C)	Percent Of Site	Community Development Potential	Soil Potential For Agriculture (c)		Soil Features Affecting Water Management (d)	
				Improved Pasture	Citrus	Drainage	Irrigation
Arrendondo-Ft. Meade – Astatula	1	13	Slight	High	High	NN	DTY, PR
Taveres-Myakka-Pomello	2	<1	Moderate	V. Low	V. Low	NN	DTY, PR
Myakka-Pomello-Basinger	3	67	Severe	High	Low	CC,WT	WT, PR
Freshwater Swamp	4	9	V. Severe	V. Low	V. Low	WT, FL	WT, FL
Astatula-Tavares-Basinger	5	11	Slight	Low	High	NN	DTY, PR

(a) The overall rating for the association is based on the rating for dominant soil (soil that makes up the greatest percentage of the association) or soils, if more than one soil has the same rating.

(b) Degree and Kind of Limitations Affecting Selected Uses:
Slight - soil properties are generally favorable for stated use and any limitations are minor and easily overcome.

Moderate - some soil properties are unfavorable but can be overcome or modified by special planning and design.

Severe - soil properties are so unfavorable and so difficult to correct or overcome that major soil reclamation, special designs, or intensive maintenance is required.

(c) High-level management is assumed, which includes water management.

(d) Abbreviations:
DTY - Droughty, CC - Cutbanks Cave, NN - Not Needed, PR - Percolates Rapidly, WT - Wet, FL - Flood, V - Very

SOURCE: EPA, 1978

3.2.2 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

3.2.2.1 The No Action Alternative

The geology and soils resources on the proposed mine site would remain basically in their present state if the no action alternative is taken. The geologic formations would not be disturbed and the soils would continue to support pasture grasses, vegetative cover and limited agricultural crops.

3.2.2.2 The Action Alternatives Including the Proposed Action

3.2.2.2.1 Mining Method Alternatives

Dragline (Mobil's Proposed Action): The proposed mining operation would disturb 15,194 acres (93 percent) of the South Fort Meade site. Included in this area are 566 acres of orange groves of which 446 acres are classified as unique citrus lands. This represents approximately 0.3 percent of the citrus producing land in Polk County, Florida.

Mining the site would involve removing the overburden in order to expose the ore bearing deposit consisting of the lower section of the undifferentiated clastics zone. The phosphate matrix, averaging 25 feet thick, would be removed to the clay bed overlying the Hawthorn Formation, and the bottom of the mine excavation would average 45 feet below present ground surface. The void created by matrix removal would be filled with overburden, sand tailings and clay wastes. Soils in the disturbed area would undergo major disruption and loss of identification.

The practice of leach zone management would allow the leach zone material to be placed in a pocket at the bottom of the mined area (pocket toe spoiling), to be subsequently covered with overburden spoil. This would minimize the impact of redistribution of naturally occurring radionuclides during the mining operation and reduce surface radiation levels on reclaimed landforms. (See also Section 3.3, Radiation.)

Bucket Wheel: Mining with bucket wheel excavators would have similar impacts on the geology and soils resources as those for the dragline.

Dredge: Leach zone management could not be achieved with the dredge method of mining; therefore, radiation levels would be higher in the reclaimed landforms with this method than with the proposed action. Other impacts would be similar to the dragline method.

3.2.2.2.2 Matrix Processing Alternatives

Conventional Beneficiation (Mobil's Proposed Action): The beneficiation process would remove phosphate product from waste clays and sand contained in the phosphate matrix. The waste clays would then be piped to storage impoundments for dewatering. Mobil reports that the mine site contains a total of 150 million tons of phosphate resource. With present technology, phosphate with a particle size smaller than 200 mesh cannot be recovered. Thus, the mine site contains 119 million tons of recoverable phosphate (particle size greater than 200 mesh) and 31 million tons of unrecoverable phosphate. Conventional processing proposed at the South Fort Meade site would extract about 77 million tons of the recoverable phosphate from the ore, with approximately 42 million tons of recoverable phosphate lost with the waste clays and sand tailings. This constitutes an efficiency of 65 percent in recovering the "recoverable" phosphate. Mobil is actively pursuing development of advanced process technology that would allow for recovery of phosphate smaller than 200 mesh. The phosphate contained in the waste clays could be reprocessed when such technology is developed.

Dry Separation: Dry separation involves processing the pulverized matrix through a fluidized air bed favoring separation of pebble phosphate and clay. Since the phosphatic ore at the proposed mine is primarily fine material, less than 48 percent of the recoverable phosphate (57 million tons) could be separated through this processing method. The dry waste clays with fines would be placed in mined areas eliminating the need for above-grade storage. If advanced phosphate recovery technology becomes feasible, remining and processing of the waste clays could be done in the future.

3.2.2.2.3 Waste Disposal Alternatives

Conventional Clay Settling Case (Mobil's Proposed Action): Approximately 50 percent (8,170 acres) of the mine site would be above-grade clay settling ponds with an average dam height of 38.7 feet. The increased loading on the Hawthorn Formation from the above-grade waste storage would average about 17 pounds per square inch (psi). The clay settling areas would contain 58 million tons of phosphate resource that could be remined should advanced recovery technology be developed. The 58 million tons of phosphate would be contained in a mixture with 74 million tons of clay. This 132 million tons of clay residue has a ratio of 0.44 tons of phosphate to one ton of clay. This is termed a concentration ratio and describes the phosphate to total residue relationship as a decimal fraction. Therefore, the smaller the decimal fraction, the greater the amount of material that would have to be processed in order to obtain one ton of phosphate.

Sand/Clay Cap Case: The dam heights for the 7,580 acres of clay settling basins required for this alternative would average 36.7 feet above natural grade. This is two feet less than the average dike height for the conventional waste disposal case, resulting in an average loading to the Hawthorn Formation of about 16 psi. The addition of a sand/clay cap to the clay settling basins would slightly increase the future effort required to recover phosphate from the clay wastes. Mobil could either use earthmoving equipment to strip off the sand/clay cap, or could remine and process the cap together with the clay settling basins. In the latter case, the phosphate resource would be about 60 million tons and the concentration ratio would be 0.35.

Sand/Clay Mix Case: The sand/clay mix case would result in 3,352 acres of sand/clay mix impoundments and 4,827 acres of clay settling ponds above natural grade. The average dike height for the 8,179 acres of above-grade basins would be 35 feet. The increased loading to the Hawthorn Formation would average about 16 psi. Should advanced phosphate recovery technology become available, the sand/clay mix areas would be more difficult to reprocess because of the presence of the additional sand. Considering both the clay settling and sand/clay mix basins together, the concentration ratio would be approximately 0.26. Phosphate resources in the clay settling basins and sand/clay mix basins would be about 65 million tons.

Overburden Mix Case: Overburden sand would be used to supplement the sand tailings mixed with clay, resulting in a waste disposal method similar to sand/clay mix. The average dam height for 8,339 acres of above-grade settling basins would be 38 feet above natural grade. The increased loading to the Hawthorn Formation would average about 17 psi. Potential recovery of phosphate from waste clays would be more difficult with this case because of the large volume of sand/clay mix areas. The concentration ratio would be 0.16 for this case. Phosphate resources which would be contained in the sand/clay mix basins would be about 65 million tons.

3.2.2.2.4 Reclamation Alternatives

The proposed action and alternative reclamation plans consist of different combinations of nine different types of landforms. A brief description of these landforms and plant available nutrient analyses are presented in Table 3.2-4. More detailed discussions of the landforms are presented under the proposed action and each alternative.

Conventional Clay Settling Plan (Mobil's Proposed Action): The conventional plan provides for the reclamation of all the land disturbed by mining. Acreages of the land areas to be reclaimed are presented below, and characteristics of the reclaimed landforms are discussed in the following subsections.

Reclaimed Landform	Reclaimed Acreage
Sand Tailings Fill Areas with Overburden Cap	5,034
Above-Grade Clay Settling Areas (Uncapped)	6,681
Above-Grade Clay Settling Areas with Sand Cap	1,489
Below-Grade Clay Settling Areas	1,513
Miscellaneous Areas (including overburden fill areas)	477
Total	15,194

Sand Tailings Fill Areas with Overburden Cap: Sand tailings are composed almost entirely of sand-sized particles, resulting in a reclaimed landform with good structural stability and internal drainage properties. Sand tailings are low in plant available nutrients with the exception of calcium and

TABLE 3.2-4

DESCRIPTION OF POTENTIAL RECLAIMED LANDFORMS

Landform	pH Range (units)	Plant Available Nutrients (lbs/acre)				Descriptive Comments
		Ca	Mg	P	K	
Sand tailings fill area with overburden cap	4.2 -6.7	451	119	654	41	Good structural stability Good internal drainage, very low moisture retention capacity Favorable agronomic properties*
Above-grade clay settling area, uncapped	6.6 - 7.3	6,368	1,487	1,152	282	Poor structural stability Excellent moisture and nutrient retention capacity Subject to waterlogging in wet season High nutrient availability Difficult to cultivate
Above-grade clay settling area with sand cap	6.3 - 8.5	6,833	273	2,628	7	Sand cap enhances structural stability of above-grade settling areas Low moisture and nutrient retention capacity Agronomic properties limited to seasonal forage production
Below-grade clay settling area	6.6 - 7.3	6,368	1,487	1,152	282	Designed specifically for wetland reclamation Consists of areas of open water adjoined by seasonally flooded zones
Above-grade clay settling area with sand/clay mix (4:1) cap	6.3 - 8.5	6,740	516	2,333	62	Sandy loam soil (standard soil textural classification) Load bearing capacity greater than clay soils Not suited for immediate structural development but sufficient to support growth of mature trees Good moisture and nutrient retention capacity Good internal drainage Favorable agronomic properties
Above-grade clay settling area with overburden cap	4.2 - 6.7	451	119	654	44	Good moisture and nutrient retention capacity Poor structural stability Good nutrient availability Favorable agronomic properties
Above-grade sand/clay mix (2:1) area	6.3 - 8.5	6,678	676	2,136	99	Sandy clay loam soil (standard soil textural classification) Load bearing capacity greater than clay soils Not suited for immediate structural development but sufficient to support growth of mature trees Good moisture and nutrient capacity Poor internal drainage Favorable agronomic properties
Above-grade clay settling area with sand/clay mix (2:1) cap	6.3 - 8.5	6,678	676	2,136	99	Sandy clay loam soil (standard soil textural classification) Not suited for immediate structural development but sufficient to support growth of mature trees Good moisture and nutrient capacity Poor internal drainage Favorable agronomic properties
Overburden fill area	6.2 - 6.7	451	119	654	41	Good structural stability Good internal drainage Favorable agronomic properties

Abbreviations:

Ca - Calcium
Mg - Magnesium
P - Phosphorus
K - Potassium

SOURCE: STUDY DATA

phosphorus which are provided by the residual phosphate particles. In addition, sand tailings soils have low retention capacities for moisture and applied nutrients due to the virtual absence of clay. If left as the surface soil, these soils would have a low potential for agricultural productivity. Therefore, all sand tailings fill areas would be capped with overburden to an average depth of two feet in order to provide a reclaimed soil with favorable agronomic properties and to bring the reclaimed surface to approximately premining grade. The overburden soils used for cap material should equal the existing surface soils in terms of potential agricultural productivity. The 5,034 acres of sand tailings overburden cap area more closely approximates the premining soil conditions than any other reclaimed landform except for overburden fill.

Above-Grade Clay Settling Areas (Uncapped): The 6,681 acres of uncapped above-grade clay fill areas would have phosphatic clay both as the backfill material and the reclaimed surface soil. These areas would undergo a period of subsidence and the reclaimed soil would have poor structural stability. Without expensive adaptation such as the use of pilings, these areas would not be suited for structural development.

Phosphatic clays have some favorable agronomic properties according to University of Florida soil test recommendations. Site-sampled levels of calcium, magnesium and phosphorus are over ten times the levels considered to indicate high availability for these essential elements. Levels of available potassium are at or above the levels considered to indicate a high availability for this nutrient. Of the major fertilizer nutrients, only nitrogen is deficient in phosphatic clay soils. The dominance of clay gives excellent moisture and nutrient retention capabilities. However, this soil is difficult to cultivate and is subject to waterlogging during the wet season. Because of this, phosphatic clay soils are best suited to perennial forage crops which will tolerate periodic flooding and which require no cultivation after establishment.

Above-Grade Clay Settling Areas with Sand Cap: The 1,489 acres of capped clay settling areas would have a sand tailings cap averaging nine feet thick as the surface soil and clay as the subsurface fill. The sand cap would promote consolidation of the subsurface clay fill, enhancing the structural stability of this reclaimed landform. Sand tailings are agronomically inferior to phosphatic clay. Plant nutrient application requirements would be high and forage production would probably be limited primarily to the wet season. The reclaimed sand capped settling areas on the site would be best suited for use as improved pasture.

Below-Grade Clay Settling Areas: The 1,513 acres of below-grade clay filled areas are designed specifically for wetland reclamation. The clay backfill material would occupy the interspoil depressions and would be partially capped with overburden graded from adjacent spoils. Drainage outfalls and fill levels would be designed to provide areas of open water adjoined by seasonally flooded zones sloping up to graded spoil areas which would be inundated only at high water.

Miscellaneous Areas: These areas would include the overburden fill areas (308 acres), the former plant site (124 acres) and the water pool filled in with overburden (45 acres). These areas would have soils with structural properties the same as those presently existing. The areas could support tree plantings or buildings.

Sand/Clay Cap Plan: This reclamation plan would modify the acreages associated with the various reclaimed landforms of the conventional case; however, the basic layout of basins and fill areas would be essentially the same. Acreages of the various types of reclaimed disposal areas for the sand/clay cap plan are presented below and further descriptions of the reclaimed landforms are discussed in the following subsections.

Reclaimed Landform		Reclaimed Acreage
Sand Tailings Fill Areas With Overburden Cap		5,079
Above-Grade Clay Settling Areas with Sand-Clay Mix (4:1) Cap		7,580
Above-Grade Clay Settling Areas with Overburden Cap		590
Below-Grade Clay Settling Area		1,513
Miscellaneous Areas		432
	Total	15,194

Sand Tailings Fill Areas with Overburden Cap: Reclamation of the sand tailings fill areas with overburden cap would be similar to the proposed action except that an additional 45 acres of this type landform would be included with the sand/clay cap reclamation plan.

Above-Grade Clay Settling Areas with Sand/Clay Mix Cap: Above-grade clay settling areas with sand/clay cap would be used for 7,580 acres of the site, approximately 50 percent of the reclaimed area. The cap would be sand and clay mixed in a 4:1 ratio, resulting in a sandy loam soil (standard soil textural classification). Sand/clay mix soils are projected to consolidate more rapidly and have better load bearing capacity than clay soils. However, clay settling areas capped with sand/clay mix would still undergo a period of gradual subsidence. Consequently, clay settling areas capped with sand/clay mix would probably not be suited for structural development in the immediate future.

Sand/clay mix soils are expected to be good agricultural soils. In a 4:1 sand/clay mix, the clay component would contribute fertility, moisture holding capacity and nutrient retention properties to the mixture. The sand component would serve to alleviate the problems of tillage and poor permeability that are associated with clay alone. The best agricultural use of sand/clay soils would have to be determined by experimentation under field conditions, but improved pasture is a likely choice and the production of row crops such as vegetables should be feasible. The load characteristics of the 4:1 sand/clay mix should be sufficient to support the growth of mature trees.

Above-Grade Clay Settling Areas Capped with Overburden: Approximately 590 acres would be reclaimed as above-grade clay settling areas capped with overburden. The reclaimed landform characteristics of these areas would be good moisture and nutrient retention capabilities, poor structural stability, good nutrient availability and favorable agronomic properties such as tillage.

Below-Grade Clay Filled Areas: The 1,513 acres of below-grade clay settling areas would be designed specifically for wetland re-creation. As in the conventional clay settling case, the same acreage of reclaimed wetlands would replace the existing wetlands.

Miscellaneous Areas: These areas would include overburden fill areas (308 acres) and the former plant site (124 acres). These areas would have soils with structural properties the same as the existing soils and could support tree plantings or buildings.

Sand/Clay Mix Plan: This reclamation plan would modify the layout of the waste disposal areas as well as the acreages of the reclaimed landforms. The types of reclaimed landforms for the sand/clay mix plan are as follows:

Reclaimed Landform	Reclaimed Acreage
Sand Tailings Fill Areas with Overburden Cap	3,020
Above-Grade Sand/Clay Mix Areas	3,352
Below-Grade Sand/Clay Mix Areas	160
Above-Grade Clay Settling Areas with Sand/Clay Mix Cap	3,185
Above-Grade Clay Settling Areas	1,642
Below-Grade Clay Settling Areas	2,095
Miscellaneous Areas (Overburden)	1,740
Total	15,194

Sand Tailings Fill Areas with Overburden Cap: The characteristics of the sand tailings fill areas with overburden cap would be similar to the proposed action. However, there would be approximately 2,000 acres less of this landform for the sand/clay mix plan.

Above-Grade Sand/Clay Mix Areas: Because of the limited volume of sand tailings available, there would be only 3,352 acres of 2:1 above-grade sand/clay mix areas for this reclamation plan. According to standard soil textural classification, sand and clay mixed in a 2:1 ratio is classified as a sandy clay loam soil. Loams are defined as soils in which none of the particle size classes dominate the soil properties. Therefore, the sandy clay loam soil produced by the sand/clay mix is expected to exhibit a blend of the properties of sand and clay. Sand/clay mix soils are projected to consolidate more rapidly and have better load bearing capacity than clay soils. However, the sand/clay mix fill areas are still projected to undergo a period of gradual subsidence as the clay component dewaters. Consequently, these areas would probably not be suited for structural development in the immediate future.

Sand/clay mix soils are projected to be good soils from an agronomic standpoint. The clay component would provide fertility, moisture holding capacity, and nutrient retention properties to the mixture, while the sand would serve to alleviate the problems of tillage and waterlogging that are associated with clay alone. These soils should be suited for a variety of agricultural uses. Improved pasture is a likely choice since forage crops can be selected that would thrive on the reclaimed soils, and the load bearing capacity of the mix should be sufficient to support the growth of mature trees. As the tillage properties of the soil improve with the development of soil organic matter, the production of row crops such as vegetables may become feasible.

Below-Grade Sand/Clay Mix Areas: The 160 acres of sand/clay mix areas would be designed for runoff retention during the wet season. These areas would be slightly above the water table and, therefore, subject to desiccation.

Above-Grade Clay Settling Areas Capped with Sand/Clay Mix: Approximately 3,185 acres of land would be reclaimed as above-grade clay fill areas with a five foot cap of 2:1 sand/clay mix. The surface soil characteristics of the sand/clay mixture would be similar to the other sand/clay mix areas described in this reclamation plan. These areas would not be as structually sound as the sand/clay mix areas.

Above-Grade Clay Settling Areas: Because insufficient sand tailings are available to reclaim all the waste clay areas with a 2:1 sand/clay mix, approximately 1,642 acres would be reclaimed as above-grade clay settling areas.

The characteristics of this reclaimed landform would be similar to the description in the proposed action.

Below-Grade Clay Settling Areas: Approximately 2,095 acres of below-grade clay settling areas would be re-created as wetlands, 582 acres more than the proposed action.

Miscellaneous Areas: These areas would include overburden fill areas (733 acres), graded spoil areas (838 acres), the backfilled clear water pond (45 acres) and the reclaimed plant site (124 acres). Soils in these areas would have the same capability as the existing soils have to support tree plantings or building foundations.

Overburden/Clay Mix Plan: The overburden/clay mix reclamation plan would utilize overburden sand as a supplement to the sand tailings in order to produce more sand/clay mix reclaimed landforms. The types of reclaimed landforms for this method are described in the following subsections and the acreages are listed as follows:

Reclaimed Landform	Reclaimed Acreage
Sand Tailings Fill Areas with Overburden Cap	3,020
Above-Grade Sand/Clay Mix (2:1) Areas	5,492
Above-Grade Clay Settling Areas with Sand/Clay Mix (2:1) Cap	2,847
Below-Grade Clay Settling Areas	2,095
Miscellaneous Areas (Overburden)	1,740
Total	15,194

Sand Tailings Fill Areas with Overburden Cap: The sand tailings fill areas with overburden cap (3,020 acres) would have the same size and characteristics as those described in the sand/clay mix plan.

Sand/Clay Mix Area: Approximately 5,492 acres, or 36 percent of the reclaimed land area, would be 2:1 sand/clay mix. The characteristics for the sand/clay mix areas would be the same as those described under the sand/clay mix alternative case.

Above-Grade Clay Settling Capped with Sand/Clay Mix: Approximately 2,847 acres of land would be reclaimed as above-grade clay fill areas with a five foot cap of 2:1 sand/clay mix. The surface soil characteristics of the sand/clay mix cap areas would be the same as described in the sand/clay mix plan.

Below-Grade Clay Settling Areas: The 2,095 acres of below-grade clay settling areas would be designed for wetland re-creation. This is similar in size and characteristics to the proposed action.

Miscellaneous Areas: These areas would include overburden fill areas (733 acres), graded spoil areas (838 acres), the backfilled clear water pond (45 acres) and the reclaimed plant site (124 acres). Soils in these areas would have the same capability as the existing soils to support tree plantings or building foundations.

3.2.2.2.5 Water Source Alternatives

Groundwater (Mobil's Proposed Action): Groundwater withdrawal for the proposed mining operation would be primarily from the Floridan Aquifer. Dewatering would be conducted in the Surficial Aquifer in the vicinity of the mining cuts. In no case would the water table be lowered below the limestone unit; this would protect against any associated collapse of the geologic formation.

Surface Water: No significant adverse effects on the area's geology and soils would be expected as a result of using surface water as a source of water supply for the proposed mining operation.

3.3 RADIATION

3.3.1 THE AFFECTED ENVIRONMENT

Central Florida phosphate deposits originated in the Middle Miocene period (approximately 20 to 25 million years ago) as a result of undersea precipitation and deposition of phosphatic minerals. As these minerals generally exhibit uranium concentrations several orders of magnitude greater than most other natural materials, radiation levels elevated with respect to ambient background levels can result from the mining and processing of phosphate deposits. Mining, transporting and processing the phosphate matrix and overburden can increase exposure by allowing gaseous and particulate radioactive materials to become airborne, by increasing the potential for groundwater and surface water radioactive contamination through leaching and suspension by runoff, and by introducing radioactive material into the food chain through the application of fertilizers or the inadvertent contamination of plants by irrigation water or airborne dust.

The Central Florida Phosphate Industry Areawide EIS and its supplements give an in-depth description of the nature of radioactivity, its potential environmental effects, its presence in central Florida phosphate deposits, and the means used for measuring its presence and assessing its effects (EPA, 1978). The conclusion in the Areawide EIS is that the radioactive isotopes of environmental importance to the central Florida phosphate mining industry are those in the Uranium-238 decay series. This is because of their abundance in the soils and phosphate ore, and the tendency of certain daughter isotopes to accumulate in human tissue and/or be readily transported as a gas.

3.3.1.1 Uranium, Radioactivity and Exposure

The association of uranium with phosphatic mineral deposits is the source of almost all naturally occurring radiation in these deposits. Uranium-238, comprising 99.28 weight percent of mineral uranium, has a half-life of 4.5×10^9 years, and a specific activity of 0.33×10^6 picocuries per liter (pCi/l). Since uranium-238 is the parent radionuclide for the entire family of decay products, its specific activity establishes the concentration of its progeny under conditions of radioactive equilibrium. The nature of radioactive decay implies that if the parent and its daughter radionuclides are maintained in a sealed environment, a steady state decay series is reached. It appears that such equilibrium exists in undisturbed phosphate deposits, at least for the radionuclides through radium-226.

The radionuclides in the uranium series of greatest interest to human exposure are radium-226, its decay product radon-222, and radon's sequential decay products, polonium-218, lead-214, bismuth-214 and polonium-214 (known collectively as the "radon daughters"). Radium-226 is of the same elemental group as calcium and exhibits a strong tendency to replace calcium in bone and other environments. It has a relatively long half-life (1,620 years) and may enter the body through ingestion of food or water containing radium, or by breathing airborne dust contaminated with radium. While immobilized in the soil, radium-226 causes radiation exposure by generation of radon-222. This inert gas can diffuse upwards through the soil and become airborne. In the atmosphere, radon-222 may be inhaled, increasing radiation exposure to the lungs. The radon daughters, although they are not gaseous, enter the body primarily through the lungs as respirable particles generated by the radioactive decay of airborne radon. These five elemental radionuclides are responsible for the majority of human exposure to radioactivity associated with phosphate mining.

3.3.1.2 Uranium and Phosphate Deposits

Uranium present in the marine environment in the Middle Miocene period was deposited along with the primary phosphatic mineral apatite which has a chemical formula of $Ca_5(PO_4)_3(F,Cl,OH)$. Apatite typically exhibits uranium concentrations of 50 to 200 parts per million, while most other minerals have maximum concentrations in the phosphatic matrix of a few parts per million with normal concentrations of a few parts per billion. In contrast, commercial mining of uranium generally exploits ores with uranium concentrations of 0.1 to 0.4 percent (1,000 to 4,000 parts per million).

The soils above the phosphate deposit (the matrix) are generally mixed strata of sands and clays exhibiting low concentrations of radionuclides (20 to 30 parts per million). Immediately above the matrix a zone of leached material is usually, but not always, present. This zone may or may not contain leached phosphate ore which results from groundwater movement through the phosphate matrix, converting the matrix to aluminum phosphate. Aluminum oxide is an undesirable impurity in a phosphate rock product. Where a leach zone has been created, the uranium concentrations of that zone are higher (100 to 300 parts per million) than those in the overburden above it, and the leach zone is typically not mined. Leach zone material can be segregated from matrix and overburden and replaced in the bottom of the mine pit where the matrix has been removed. This process, referred to as leach zone management, serves to redeposit the more radioactive material at a greater depth.

The phosphate matrix is composed of the phosphatic minerals, quartz sands, and nonphosphatic clays in roughly equal proportions. Uranium concentrations are typically 100 to 200 parts per million. Uranium concentrations in the phosphate fractions differ greatly. Roessler et al. (1978) found an approximate 20 percent increase in uranium concentration in pebble product over the matrix and a 20 percent decrease for rock concentrate. Tailings exhibited uranium concentrations of 12 percent of those in the matrix, while waste clays exhibited uranium concentrations of 10 percent of those in the matrix.

Reclaimed land has the potential to exhibit greater radioactivity than unaltered land. This potential is affected by such factors as the presence or absence of leach zones, leach zone management techniques employed, the amount of overburden present, and the waste disposal/reclamation techniques employed. Values of various radiological parameters for several types of land are given in Table 3.3-1. Debris lands show the highest activities, followed by land reclaimed with waste clays. Debris lands were reclaimed before the development of flotation technology to separate the rock concentrates from sand, and so contain large amounts of phosphate and uranium.

3.3.1.3 Radiation Existing at the Site

Surface and Near-surface Soils: Direct gamma radiation exposure over the proposed mining area was determined by measuring incident gamma radiation with a portable scintillation meter at intervals of approximately 50 yards along transects one meter above the ground. The gamma survey showed levels of 3.5 to 5.5 microroentgen per hour (uR/h) over most of the tract with an overall average of 4.4 uR/h. Increased radiation levels were noted where local geography brought deeper strata with greater radioactivity closer to the surface along creek beds. This increase in radioactivity was around 40 percent along Bowlegs Creek in the northeastern corner of the site and as much as 400 to 600

TABLE 3.3-1

SUMMARY OF RADIOLOGICAL CHARACTERISTICS OF VARIOUS LAND TYPES - POLK COUNTY

Land Type	Surface Soil (0-0.3m) ^{226}Ra (pCi/g)		Soil Core (0-1.8m) ^{226}Ra (pCi/g)		Gamma Level (μR/h)		Radon Flux (pCi/m^2.s)	
	N	Mean (range	N	Mean (range)	N	Mean (range)	N	Mean (range)
Unaltered Unmined	20	0.6(0.1-3.8)	18	0.4(0.2-3.1)	9	5(4-7)	17	0.2(<0.1-1.7)
Radioactive Fill	2	3.2(2.5-4.1)	2	2.2(1.1-4.4)	1	9 ---	2	1.3(0.6-2.8)
Tailings	20	3.2(0.4-9.2)	16	3.1(0.5-8.7)	11	11(6-16)	19	0.7(<0.1-2.7)
All Overburden[a)]	23	5.0(0.8-35.3)	24	5.3(1.0-23.1)	16	13(7-33)	27	1.5(<0.1-12.8)
Capped and Mixed Clays[b)]	6	6.8(3.3-14.6)	6	7.4(2.8-18.3)	6	17(11-24)	6	1.6(0.3-7.2)
Debris	18	9.5(3.4-23.3)	18	7.3(3.1-24.7)	8	22(11-54)	15	4.2(1.7-13.7)

N = Number of sites in summary

Means are geometric means of average values for N sites of indicated land type

a) Overburden category includes reclaimed overburden piles and sand-fill reclamations capped with overburden

b) Clay category includes settled clays areas capped with overburden and/or tailings and clay-sand mixtures capped with overburden

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SOURCE: ROESSLER, 1978

percent along the western edge. These radiation levels are low, representing only a small increase over the cosmic radiation level of 3.6 uR/h. Comparison of these data with the typical gamma levels for undisturbed lands in central Florida (5 uR/h) shows that the South Fort Meade site is generally lower in surface gamma radiation than similar land types in this region.

Surface soil samples were collected at 16 sites and radium-226 concentrations were measured. Concentrations ranged from 0.2 to 1.1 pCi/g, with an average of 0.4 pCi/g. Values generally correlated well with the observed gamma radiation levels. The average is almost identical to the area-wide average for undisturbed lands (0.6 pCi/g), and the maximum radium-226 content at the South Fort Meade site is about one third of the maximum observed in central Florida (3.8 pCi/g).

To determine near-surface soil radioactivity six-foot core samples were collected at nine representative locations on the South Fort Meade site. If the water table allowed, the cores were sectioned into one-foot segments before analysis. Again, radium-226 concentrations were low, ranging from 0.2 to 0.4 pCi/g with an average of 0.3 pCi/g for the upper one foot of soil, and ranging from 0.2 to 1.0 pCi/g with an average of 0.6 pCi/g for the five-foot to six-foot samples. Typical radium-226 concentrations observed in the area ranged from 0.2 to 3.1 pCi/g, with an average of 0.4 pCi/g.

The radiological profiles fell into two groupings. One group maintained a uniformly low activity throughout the six-foot depth, while the other group exhibited activity that increased slightly with depth. This behavior correlated with the two general soil types of the area, one in which the sandy soil is underlain by clay within the top six feet and one in which it is not. The deeper sands, with no clay within the top six feet, showed a uniformly low activity throughout their depth, while those with clay showed a slight increase in radioactivity with depth. In general, external gamma radiation levels and surface and near-surface soil radium concentrations were low over the entire site. Some localized areas of significantly higher radioactivity were present where erosion had brought more active formations closer to the surface. This is particularly true along some stream beds.

Mined Section Profile: Cores were drilled through the matrix at six sites in the study area to evaluate the potential radiological effects of overburden disruption. Phosphate matrix portions were separated from the overburden and sampled. The overburden was sectioned and composite samples were also prepared. Although each site exhibited significant differences, a general pattern was shown of low activity (less than or equal to 1.0 pCi/g) at the surface, increasing gradually through the overburden to 1.0 to 8.0 pCi/g above the leach zone. If present, the leach zone exhibited widely varying radioactivity (3.0 to 60 pCi/g). In the matrix, however, composite matrix averages at the six sites ranged from 12 to 22 pCi/g.

Matrix and Fractions: The matrix samples obtained at the six coring sites were subjected to pilot plant beneficiation, and the various fractions were analyzed to determine the radium-226 concentrations. These fractions included a composite matrix sample, phosphate pebble, clays +35 mesh (flotation feed, concentrate, and tailings), and clays -35 mesh (flotation feed, concentrate, and tailings). The analytical results for the six locations are presented and summarized in Table 3.3-2.

The radioactivity of the matrix and its fractions is fairly consistent from site to site. In general, the matrix averages 16.4 pCi/g and initially separates into 37.1 pCi/g pebble, 22.4 pCi/g (dry basis) waste clay suspension and two flotation feeds. The coarser 28 pCi/g feed yields a 36.5 pCi/g concentrate and 11.9 pCi/g tailings; the finer 8.0 pCi/g fraction yields a 28.1 pCi/g concentrate and 2.8 pCi/g tailings.

Deep Section: Baseline radioactivity levels in the strata underlying the phosphate matrix were determined by studying the production and monitoring wells on the tract. The deep section studied extended to a depth of about 1,200 feet. Concentrations of radium-226 in the deep well cuttings ranged from 0.4 pCi/g to 3.7 pCi/g, similar to those observed in the overburden (minus the leach zone) at the South Fort Meade site.

TABLE 3.3-2

RADIUM-226 CONTENT OF MATRIX AND FRACTIONS

Radium-226 Concentration (pCi/g) for Indicated Fractions									
				+35 Flotation			-35 Flotation		
					Floated			Floated	
Site	Matrix*	Pebble	Clays	Feed	Concentrate	Tailings	Feed	Concentrate	Tailings
5	13.8	39.4	15.9	29.9	36.8	8.7	8.3	29.9	3.5
6	13.7	37.0	12.1	30.7	34.1	11.5	7.4	24.5	3.8
7	21.9	38.0	24.4	27.2	43.3	15.7	10.3	33.9	3.6
9	20.0	35.6	45.5	24.1	36.7	9.5	7.1	27.4	2.1
10	13.1	35.1	14.8	29.2	32.7	19.4	9.4	22.7	1.7
11	15.9	37.2	21.5	28.1	35.6	6.5	7.7	30.2	2.1
Avg.	16.4	37.1	22.4	28.2	36.5	11.9	8.4	28.1	2.8
Range	13.1 - 21.9	35.1 - 39.4	12.1 - 45.4	24.1 - 30.7	32.7 - 43.3	6.5 - 19.4	7.1 - 10.3	22.7 - 33.9	1.7 - 3.8

* Matrix results are the average of two samples per site, one submitted by Mobil and one submitted by Zellars-Williams along with the benefication fractions

SOURCE: STUDY DATA

Surface Water: Water samples were taken monthly from May to December, 1979, and were analyzed for gross alpha activity. All samples which exhibited alpha activity greater than 5.0 pCi/l, plus sufficient additional samples to comprise 25 percent of the total samples collected, were analyzed for radium-226 concentration. In general, the surface water radioactivity was low. Approximately 30 percent of the samples exhibited activities below the minimum detectable level (about 1.0 pCi/l), and the overall average was less than 1.7 pCi/l. Significant variability between sampling sites and a slight tendency for higher radioactivity in the winter months of the year were noted. Sediment radium-226 concentrations also were quite low, averaging 2.6 pCi/g, although the range was from 0.3 to 12.9 pCi/g. The highest average alpha activity was noted at the station with the highest sediment radium concentration, indicating a relationship between water radioactivity and suspendable particulate content that was substantiated by the low levels in both water and sediment at many of the other stations.

Groundwater: Groundwater samples were collected during the early part of 1980 and again during the fall of 1980 to determine background radioactivity concentrations at the South Fort Meade site. Radium-226 concentrations were determined only for those samples where gross alpha radioactivity approached 5 pCi/l. (These data are reported in Table 3.4-1 of Section 3.4.3, Groundwater Quality.)

Groundwater radioactivity levels in the Surficial Aquifer at the South Fort Meade site were extremely variable; gross alpha radioactivity levels ranged from less than 0.4 pCi/l to 97.4 pCi/l. For those samples where radium-226 was detected, concentrations ranged from 1.1 to 14.6 pCi/l. The highest radioactivity levels occurred in samples with high total solids concentrations. It is likely that the high radioactivity levels in the Surficial Aquifer groundwater are due to high suspended solids concentrations. Surface water radioactivity discussed in the previous section also indicated higher radioactivity when higher concentrations of suspended particles were present. Three groundwater samples exceeded EPA's gross alpha radioactivity standard for drinking water (15 pCi/l), and two exceeded the EPA standard for radium-226 (5 pCi/l).

Groundwater samples from the Upper Floridan and Lower Floridan aquifers exhibited gross alpha radioactivity levels of 48.4 and 34.3 pCi/l, respectively. Although these values exceed the EPA drinking water standard of 15 pCi/l, the radium-226 concentrations of 4.4 and 2.3 pCi/l for the same samples are typical of Upper and Lower Floridan groundwater in the unmined, mineralized regions of central Florida (EPA, 1978).

Radionuclide Uptake in Biological Systems: A limited study was undertaken to determine the biological uptake of radium-226 by biological sampling at the unmined South Fort Meade site and a reclaimed site known as the Homeland tract. Radium-226 concentrations were determined for beef, soil, grass, vegetable and citrus samples by the method of direct gamma spectrometry. However, radioactivity levels in the tissue and vegetation samples were at the lower limit of detection for the analytical method employed, and the data have such a large standard deviation and low confidence level that no conclusions could be reached regarding differences between premining and postmining radionuclide uptake.

3.3.2 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

3.3.2.1 The No Action Alternative

Under the no action alternative the South Fort Meade site would remain in its current state. Subsurface radioactivity would remain concentrated in the matrix and the leach zone instead of being redistributed to soils nearer the surface. Thus, the expected outdoor gamma radiation levels and the Rn-222 flux would be lower than would be expected to occur after mining and reclamation. Structures, including residences, would have lower indoor concentrations of radon progeny on undisturbed land than on reclaimed land. Occupational radiation exposures resulting from phosphate mining and beneficiation would not occur, and additional exposure to residents near the mining and processing operations (due to inhalation of particulates) would be avoided.

3.3.2.2 The Action Alternatives Including the Proposed Action

3.3.2.2.1 Mining Method Alternatives

Dragline (Mobil's Proposed Action): The use of a dragline to remove overburden and matrix ore would have several potential radiological impacts. Each dragline would dig a series of parallel cuts up to one mile long and approximately 330 feet wide, and the overburden, typically containing low levels of radionuclides (1 to 8 pCi/g), would be placed in a previously mined area. Mobil would practice leach zone management by placing the radioactive leach zone material (3 to 60 pCi/g) in a pocket at the bottom of the mined-out area (pocket toe spoiling), subsequently covering the leach zone material with overburden. This would minimize the impact of redistributing naturally occurring radionuclides during the mining operation and would reduce surface radiation levels on reclaimed landforms.

A moderate amount of dewatering of the mining cut is required for dragline safety and the optimum recovery of matrix. This dewatering is not considered to have a major radiological impact (EPA, 1978). The potential occupational radiation exposure to phosphate miners is low. Prince (1977) measured radiation levels in the vicinity of draglines to be about 5 uR/h (as compared to the average 4.4 uR/h baseline measured at the South Fort Meade site). Radiation standards for exposure to Rn-222 and its short-lived daughters are expressed in terms of working level (WL) concentrations. One WL is the amount of any combination of short-lived radioactive daughters of Rn-222 in 1 liter of air that will release 1.3×10^5 MeV of alpha energy during their decay to Pb-210. Radon progeny concentrations were found to be low (0.0004 WL) in the actively mined areas. In comparison, these exposure levels are far lower than measured values for slab-on-grade structures on unmined land in Polk County (0.001 to 0.032 WL).

Bucket Wheel: Radiological impacts from the use of bucket wheel excavators would be similar to those experienced with the use of draglines. Bucket wheel excavators can be very selective and would be capable of performing leach zone management.

Dredge: The use of dredges to remove the overburden and mine the phosphate ore would have several radiological effects not present with the dragline method. Selective leach zone removal and placement would be impossible to practice using the dredge due to indiscriminate placement of leach zone material in the spoils area. Radiation levels in the reclaimed landforms would thus be greater with this method than with the dragline method. The water used to transport the overburden and leach zone material could increase in radioactivity due to the presence of suspended radioactive particles. These suspended particles would enter the recirculation system and perhaps elevate radiation levels in the waste disposal areas and water discharge.

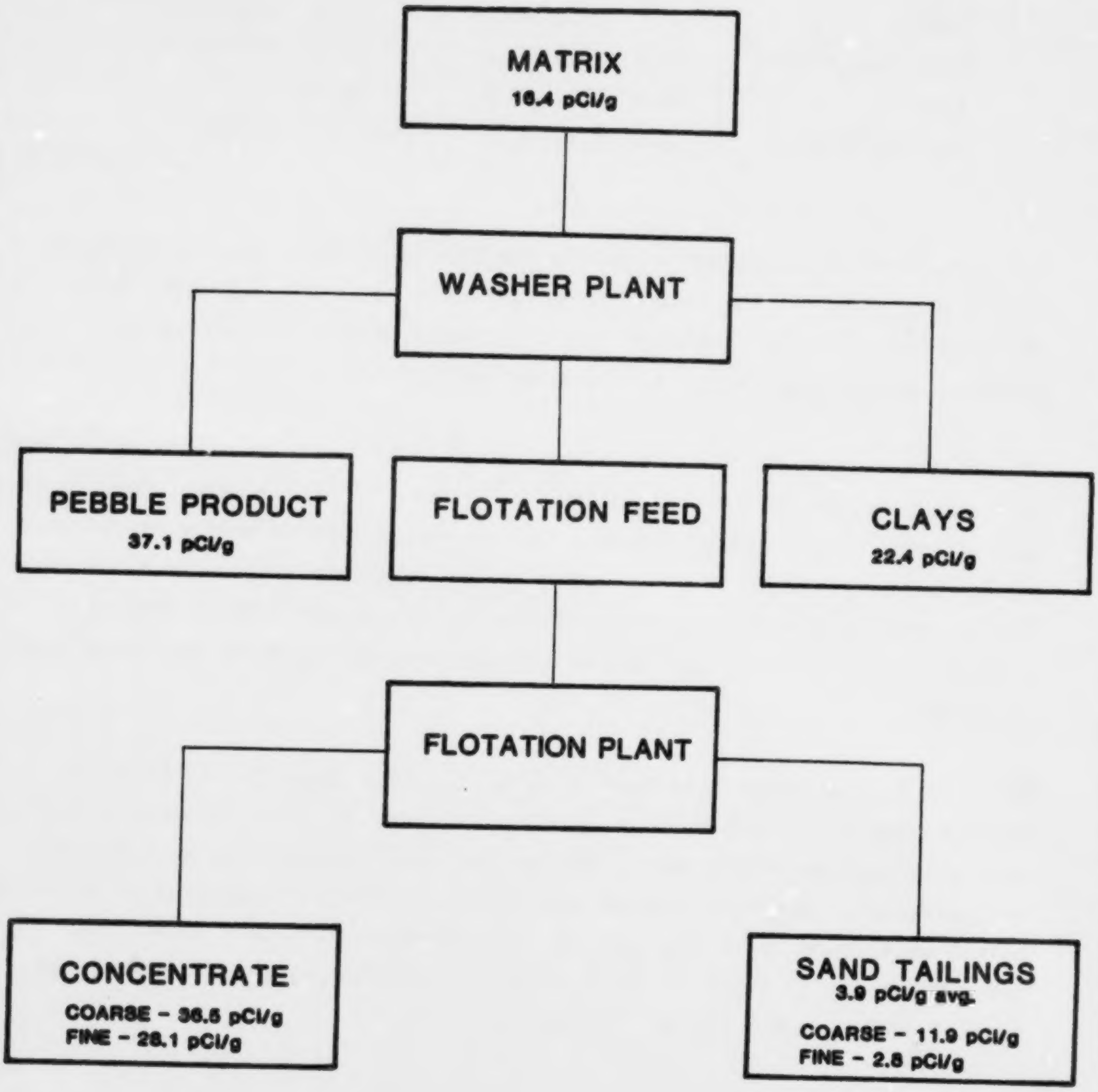
3.3.2.2.2 Matrix Processing Alternatives

Conventional Beneficiation (Mobil's Proposed Action): Conventional processing of slurried matrix would redistribute naturally occurring radionuclides between products and wastes. Pilot scale beneficiation of South Fort Meade matrix was performed to examine this redistribution. As shown in Figure 3.3-A, slurried matrix contained an average of 16.4 pCi/g of radium-226. The slurry was processed in a washer plant where a pebble product was separated from the flotation feed and waste clays. Projected radium-226 in the pebble product was 37.1 pCi/g; waste clays contained an average of 22.4 pCi/g.

The coarse feed was processed further in a flotation plant where it was separated into a concentrate product averaging 36.5 pCi/g and sand tailings averaging 11.9 pCi/g. The fine feed fraction was separated into a concentrate product (28.1 pC/g) and sand tailings stream (2.8 pCi/g). The composite sand tailings stream contained an average radium-226 concentration of 3.9 pCi/g. The radioactivity levels of the fractions determined in the pilot-scale beneficiation test were variable, as shown below, with the exception of the level of the pebble product. Radium-226 concentrations in the proposed mine's phosphate matrix, products, sand tailings and waste clays appear to be somewhat

FIGURE 3.3-A

SCHEMATIC DIAGRAM OF BENEFICIATION AND ASSOCIATED RADON-226 LEVELS FROM PILOT PLANT TESTS


MATRIX
16.4 pCi/g
WASHER PLANT
PEBBLE PRODUCT
37.1 pCi/g
FLOTATION FEED
CLAYS
22.4 pCi/g
FLOTATION PLANT
CONCENTRATE
COARSE - 36.5 pCi/g
FINE - 28.1 pCi/g
SAND TAILINGS
3.9 pCi/g avg.
COARSE - 11.9 pCi/g
FINE - 2.8 pCi/g

SOURCE: MOBIL

lower than the average for the area. The following chart compares the South Fort Meade values to those reported for central Florida (Roessler, 1979):

	South Fort Meade (pCi/g)		Central Florida (pCi/g)	
	Avg.	Range	Avg.	Range
Matrix	16.4	10.7-22.1	37.6	18.1-184.2
Pebble	37.1	35.1-39.4	57.4	44.5-96.6
Rock Concentrate	32.3	22.7-43.3	37.1	26.0-50.7
Clay	22.4	12.1-45.4	52.0	-
Sand tailings	3.9	1.7-10.3	5.2	1.7-12.2

Wet processing of the slurried matrix during conventional beneficiation has little potential for the generation of airborne radioactivity associated with particulates. Radiological exposure due to the release of particulate material during processing is considered negligible.

The external gamma radiation levels in beneficiation plants have been reported to be about twice the background levels (Prince, 1977). However, results of a work-station survey found occupancy factors low enough to reduce annual exposures to insignificant levels. Radon progeny concentrations were below the levels reported for slab-on-grade structures on unmined land (0.0007 WL). Therefore, the radiological impacts to operating personnel at the plant should be minimal.

Wet rock storage piles have been reported to yield gamma radiation at an average rate of 67 uR/h (Prince, 1977). However, occupancy factors around such piles are extremely small, making the annual exposure to an individual insignificant. Wet rock storage and transfer tunnels (located under wet rock piles) were found to be the most serious radiological hazard areas. WL measurements at 11 sites in the Central Florida Phosphate District were between 0.0007 WL and 0.096 WL (Prince, 1977).

Dry Separation: The dry separation process would have the potential for generating large amounts of clay- and dust-size particulates which could lead to exposure to radiation through inhalation. Greater exposure to radiation would be expected from the use of the dry-separation process than from the conventional beneficiation process.

3.3.2.2.3 Waste Disposal and Reclamation Alternatives

Conventional Clay Settling Plan (Mobil's Proposed Action): The two major types of wastes requiring disposal would be clay and sand tailings. As was discussed in the section on processing, waste clays at the South Fort Meade site have a much higher average radium-226 level (22.4 pCi/g) than the sand tailings (3.9 pCi/g). The method of disposal and land reclamation would determine future surface radium-226 concentrations. Table 3.3-3 presents the acreages associated with each reclaimed land type and the estimated radiological characteristics for the conventional clay settling case. The soil radium-226 levels shown are for the top two feet of reclaimed land. Gamma radiation levels were estimated by the method in Report No. 45 of the National Council on Radiation Protection and Measurements (NCRPM, 1975). No average gamma radiation level was determined for the below-grade clay settling areas since the level is dependent on the amount of water present. Submerged clay settling areas are expected to exhibit little or no gamma radiation due to the attenuation of water. Pocket toe spoiling would prevent the leach zone material from affecting the surface radiation levels.

A major problem discussed in the Areawide EIS is the potential hazard of exposure to indoor radon progeny measured as WL within slab-on-grade residential and public structures. Should buildings be located on the reclaimed site, indoor radon and radon progeny concentrations would be higher in these structures than outdoors. Two WL standards have been proposed for existing homes: (1) a 0.029 WL total exposure including background (Florida Department of Health and Rehabilitation Services, 1975) and, (2) a 0.020 WL total exposure including background (EPA, 1979b). The reclamation processes and undeveloped lands were not addressed in detail in EPA's 1979 recommendations to the Governor of Florida (EPA, 1979b). However, the following specific guidance

TABLE 3.3-3

ESTIMATED RADIOLOGICAL CHARACTERISTICS FOR RECLAIMED LANDS
(Conventional Plan)

Landform	Acreage	Gamma Radiation (uR/hr)	Soil Radium-226 (pCi/g)	Radon Flux ($pCi/m^2/sec$)	Working Level (WL)
Sand Tailings Capped with Overburden	5,034	5 (4-7)	3 (2-4)	0.873	0.0082
Overburden Fill	477	5 (4-7)	1 (<1-2)	0.59	0.0068
Above-Grade Clay Settling Areas	6,681	44 (25-85)	22 (12-45)	4.38	0.0172
Above-Grade Clay Capped with Sand Tailings	1,489	9 (7-11)	3 (2-4)	2.05	0.0121
Below-Grade Clay Settling Areas (Wetland)	1,513	(4-85)*	22 (12-45)	4.38	0.0172

Range is shown in ( ).

Calculation source for radon flux and working level: "National Radiation Exposure Assessment: Radioactivity of Lands and Associated Structures," Final Report Volume 2, February 1978, C.E. Roessler, J.A. Wethington, Jr., and W.E. Bolch.

Calculation source for gamma radiation: "National Council on Radiation Protection and Measurements" Natural Background in the United States, Report No. 45, November 1975.

Values for Radium-226 represent the top two feet of material. Calculated from soil characterization.

* The below-grade clay settling areas would be reclaimed as wetlands. The gamma radiation level would vary depending on the depth of water over the soil surface.

was provided for new homes on any reclaimed, debris and unmined lands which contain phosphate resources:

> "IV. Development sites for new residences should be selected and prepared, and the residences so designed and sited, that the annual average indoor... Working Levels...do not exceed...background levels..." (EPA, 1979b).

If the final guidance for reclaimed lands is similar to the recommendation quoted above, then the upper limit of predicted WL's in slab-on-grade homes will be approximately 0.009 WL (normal background of 0.004 WL plus the uncertainty of 0.005 WL). This proposed limit provides a basis for assessing the effectiveness of reclamation in minimizing indoor exposures to radon progeny. For any homes that are constructed on reclaimed lands at the South Fort Meade site, the predicted indoor radon progeny concentrations could range from a low of 0.0068 WL over overburden fill areas (477 acres) to 0.0172 WL over the 8,194 acres of reclaimed clay settling areas. The predicted radon progeny concentrations for homes over the 1,489 acres of clay settling areas with sand cap would be 0.0121 WL, and homes over the sand tailings fill areas with overburden cap (5,034 acres) would be 0.0082 WL. By way of comparison, slab-on-grade structures in Polk County over undisturbed lands have WL's ranging from 0.001 to 0.010, with a geometric mean of 0.003. Residences on the reclaimed overburden fill areas (477 acres) or sand tailings capped with overburden areas (5,034 acres) would have predicted indoor radon progeny marginally below the EPA recommended 0.009 WL limit described above. If residences were planned in other reclaimed areas, they would have to be designed so as to prevent the accumulation of radon progeny to levels above the recommended .009 WL limit.

There is also an interim EPA recommendation (41CFR123, June 24, 1976) to limit gamma exposure levels at new structure sites on Florida phosphate lands to 10 uR/h. Given the current degree of uncertainty as to what constitutes a "no-effects" level of radiation on reclaimed phosphate lands, it is informative to compare the various reclamation alternatives considering these proposed criteria. As shown in Table 3.3-3, the predicted gamma radiation levels for all land types except above-grade clay settling areas (44 uR/h) and below-grade clay settling areas covered with water (4 to 85 uR/h depending upon the amount of attenuation by water) meet the interim EPA recommendation for a gamma exposure level limit of 10 uR/h. The above-grade clay settling areas, constituting 6,681 acres or about 44 percent of the reclaimed lands, are considerably above the interim recommended gamma level and thus, no structures could be constructed thereon without use of some type of mitigating measures to lower the exposure levels. For the 1,513 acres of below-grade clay settling areas, the water could be expected to attenuate much of the gamma radiation, although if the area were to completely dry out, the gamma radiation could approach the level of the above-grade clay settling area. The 1,489 acres of above-grade clay capped with sand tailings would have an estimated gamma radiation level of 9 uR/hr, marginally below the interim EPA recommendation of 10 uR/hr. Overburden fill areas, comprising 477 acres, and 5,034 acres of sand tailings capped with overburden would be well below the 10 uR/hr limit.

Radionuclide uptake by crops and subsequent passage through the food chain is another area of concern on reclaimed lands. Radionuclide uptake in crops apparently is a function of soil characteristics, crop type, calcium concentration and soil radium-226 concentration. Mobil's reclamation plan calls for the return of much of the site to agricultural usage. There is no evidence that agricultural development of the reclaimed mine site would pose a significant radiological hazard through soil-to-crop-to-man food chain uptake. However, little is known about the behavior of Ra-226 uptake from this type of soil. It should be noted that current fertilizer products may contain Ra-226 up to 32 pCi/g. Thus, direct application of fertilizer products to crops may be of more concern than the direct radionuclide uptake from reclaimed soils.

Surface soil radium-226 concentrations at 16 locations on the South Fort Meade site ranged from 0.2 to 1.1 pCi/g with an average of 0.4 pCi/g. The waste disposal and reclamation process will redistribute radioactive materials in the soil profile, resulting in increased surface soil radium-226 concentrations. As shown in Table 3.3-3, surface soil radium-226 levels for reclaimed lands are expected to range from 1 pCi/g for the 477 acres of overburden fill areas to 22 pCi/g for the 6,681 acres of above-grade clay settling areas and 1,513 acres of below-grade clay settling areas. Estimated radium-226 concentrations for the 5,034 acres of sand tailings capped with overburden and 1,489 acres of above-grade clay capped with sand tailings are 3 pCi/g.

Radon flux from waste disposal materials is another concern for reclaimed landforms. The radon flux indicates the potential hazard associated with construction of slab-on-grade residential and public structures on reclaimed lands, and correlates to the indoor radon progeny measured as WL. Radon flux measurements on unaltered lands in Polk County range from <0.1 to 1.1 pCi/m^2/sec with an average of 0.2 pCi/m^2/sec (Roessler, 1978). The radon fluxes shown in Table 3.3-3 for each reclaimed landform were calculated from a bi-layer diffusion model, using parameters taken from the data of Roessler et al. (1978) for similar media. It is estimated that the process of land reclamation would increase the radon flux of the unaltered land to a range of 0.59 pCi/m^2/sec (for the 477 acres of overburden fill) to 4.38 pCi/m^2/sec (for the 6,681 acres of above-grade clay settling area and 1,513 acres of below-grade clay settling areas). Radon flux from the 5,034 acres of sand tailings capped with overburden is projected to be 0.87 pCi/m^2/sec, and 2.05 pCi/m^2/sec from the 1,489 acres of above-grade clay capped with sand tailings.

Decant water from the clay settling ponds would be recycled through the water recirculation system. The typical concentration of radium-226 in water released from clay settling areas is 1 to 2 pCi/l, which is less than the allowable concentration of 5 pCi/l in drinking water. Release of this water should have a minimal effect on the radiological characteristics of surface water supplies (EPA, 1978).

Groundwater radiation levels are not expected to increase as a result of reclamation. Groundwater in the Surficial Aquifer would be in contact with basically the same material present before mining. Moreover, some of the radioactivity initially present would remain with the product, reducing the total amount of radionuclides left in the soil.

Surface water quality is not expected to be degraded by land reclamation. Radium-226 is not very soluble (2×10^{-6} g/100 ml as radium sulfate) and is found in low concentrations (0.67 pCi/l) even in clay pond effluents, which are in contact with clays containing relatively high levels of radium-226 (22.4 pCi/g). Since waste clay settling areas would have the highest radium-226 levels of all reclaimed lands, radiological effects of reclamation on surface water are expected to be minimal.

Sand/Clay Cap Plan: The sand/clay cap reclamation plan would result in five basic landforms: above-grade clay settling areas with sand/clay mix (4:1) cap (7,580 acres), sand tailings fill areas with overburden cap (5,079 acres), below-grade clay settling areas with partial overburden cap (1,513 acres), above-grade clay settling areas with overburden cap (590 acres) and overburden fill areas (432 acres). Under the sand/clay cap alternative, the predicted exposure levels for radon progeny would range from a low of 0.0068 WL for the 432 acres of overburden fill area to 0.0172 WL for the 1,513 acres of below-grade clay settling areas (Table 3.3-4). However, it is extremely unlikely that residential structures would be built in the below-grade clay settling areas because they would be reclaimed as wetlands. The 7,580 acres of clay settling areas capped with a 4:1 sand/clay mix would produce an estimated radon progeny level of 0.0126 WL, and structures built on such lands would require measures to reduce the indoor radon progeny to below the recommended 0.009 WL limit. A total of 5,511 acres, comprised of 5,079 acres of sand tailings capped with overburden and 432 acres of overburden fill, would meet the recommended 0.009 WL limit with 0.0082 WL and 0.0068 WL, respectively (although marginally in the case of the sand tailings areas capped with overburden). Approximately the same amount of acreage is also below the recommended 0.009 WL limit for the conventional plan.

The sand/clay cap plan would result in a total of 9,683 acres of reclaimed land potentially exceeding the interim gamma radiation exposure level of 10 uR/hr, or a total of 1,479 more acres than occurs with the conventional plan. The area of sand tailings capped with overburden, with an estimated gamma radiation of 5 uR/hr, would increase slightly from 5,034 acres under the

TABLE 3.3-4

ESTIMATED RADIOLOGICAL CHARACTERISTICS FOR RECLAIMED LANDS (Sand/Clay Cap Plan)

Landform	Acreage	Gamma Radiation (uR/hr)	Soil Radium-226 (pCi/g)	$Radon_2$ Flux ($pCi/m^2/sec$)	Working Level (WL)
Sand Tailings Capped with Overburden	5,079	5 (4-7)	3 (2-4)	0.872	0.0082
Clay Capped with Overburden (Above-Grade)	590	38 (22-72)	19 (10-38)	3.67	0.0158
Overburden Fill	432	5 (4-7)	1 (<1-2)	0.59	0.0068
Below-Grade Clay Settling Areas (Wetland)	1,513	(4-85)*	22 (12-45)	4.38	0.0172
Clay Capped with Sand/Clay Mix (4:1)	7,580	18 (14-25)	10 (7-17)	2.25	0.0126

Range is shown in ( ).

Calculation source for radon flux and working level: "National Radiation Exposure Assessment: Radioactivity of Lands and Associated Structures," Final Report Volume 2, February 1978, C.E. Roessler, J.A. Wethington, Jr., and W.E. Bolch.

Calculation source for gamma radiation: "National Council on Radiation Protection and Measurements" Natural Background in the United States, Report No. 45, November 1975.

Values for Radium-226 represent the top two feet of material. Calculated from soil characterization.

* The below-grade clay settling areas would be reclaimed as wetlands. The gamma radiation level would vary depending on the depth of water over the soil surface.

conventional plan to 5,079 acres. The overburden fill area (5 uR/hr) would decrease slightly from 477 to 432 acres. The significant difference between the two cases is that the 7,580 acres of clay settling areas capped with a 4:1 sand/clay mix would have an estimated gamma radiation level of 18 uR/hr (ranging from 14 to 25 uR/hr) as compared to the 6,681 acres of uncapped clay fill in the conventional case having an estimated gamma radiation level of 44 uR/hr (ranging from 25 to 85 uR/hr). The 1,513 acres of below-grade clay settling areas would have a projected gamma radiation level ranging from 4 to 85 uR/hr depending on the amount of attenuation by water. Higher water levels in the wetland area would tend to reduce the gamma radiation levels. Only the 590 acres of clay areas capped with overburden with a projected gamma exposure rate of 38 uR/hr approach the 44 uR/hr exposure rate for above-grade clay settling areas for the conventional plan. Thus, the sand/clay cap alternative would reduce gamma exposure as compared to the conventional case.

Soil radium-226 concentrations (Table 3.3-4) are expected to range from 1 pCi/g for the 432 acres of overburden fill to 22 pCi/g for the 1,513 acres of below-grade clay settling areas. A total of 5,079 acres of sand tailings capped with overburden would have an estimated soil radium-226 concentration of 3 pCi/g. The major difference between this alternative and the conventional plan is that the large area of clay capped with a 4:1 sand/clay mix (7,580 acres) would have an estimated soil radium-226 concentration of 10 pCi/g, whereas the conventional plan would have 6,681 acres of above-grade clay settling areas at 22 pCi/g. Since surface radium-226 concentrations are generally reduced, radionuclide uptake by crops would probably be less for the clay settling areas covered with sand/clay mix (10 pCi/g) than the clay settling areas under the conventional plan (22 pCi/g).

The predicted radon fluxes are less for the sand/clay cap plan than for the conventional plan, with a range of 0.59 pCi/m^2/sec for the 432 acres of overburden fill to 4.38 pCi/m^2/sec for the 1,513 acres of below-grade clay settling, as shown in Table 3.3-4. The 5,079 acres of sand tailings capped with overburden and the 590 acres of above-grade clay settling areas would have projected radon fluxes of 0.87 and 3.67 pCi/m^2/sec, respectively. The largest reclaimed landform, the clay settling areas capped with a 4:1 sand clay mix, would have an estimated radon flux of 2.25 $pCi/m^2/sec$, significantly less than the 4.38 $pCi/m^2/sec$ projected for the 6,681 acres of above-grade clay settling areas under the conventional plan.

The radiological effects of the sand/clay cap plan on surface water and groundwater would be, for all practical purposes, identical to the conventional clay settling plan, and are expected to be minimal.

Sand/Clay Mix Plan: The sand/clay mix plan would result in six basic reclaimed landforms: sand/clay mix (3,512 acres), clay settling areas with sand/clay mix cap (3,185 acres), sand tailings fill areas with overburden cap (3,020 acres), below-grade clay settling areas (2,095 acres), overburden fill areas (1,740 acres) and uncapped above-grade clay settling areas (1,642 acres). If the sand/clay mix plan were adopted, the exposure levels for radon progeny as measured by WL would generally be lower than the conventional clay settling plan but above the sand/clay cap plan. As shown in Table 3.3-5, a total of 3,737 acres would have the highest estimated indoor radon progeny level of 0.0172 WL, including 1,642 acres of above-grade clay settling areas and 2,095 acres of below-grade clay settling areas. The below-grade settling areas would be wetlands and since these lands will be subject to frequent inundations, it is unlikely that they will be utilized for the construction of residential or public buildings. Other significant reclaimed landforms which will be above the 0.009 WL limit include 3,512 acres of 2:1 sand/clay mix at 0.00112 WL and 3,185 acres of clay capped with the sand/clay mix at 0.0125 WL. A total of 4,760 acres would be below the interim recommended limit of 0.009 WL: 3,020 acres of sand tailings capped with overburden at 0.0082 WL and 1,740 acres of overburden fill at 0.0068 WL. This acreage is less than with either the conventional clay settling or sand/clay cap alternatives.

The sand/clay mix plan results in a total of 10,434 acres of reclaimed lands which would exceed the interim gamma exposure limit of 10 uR/h. Thus, substantially more acreage exceeds this limit under the sand/clay mix plan than occurs with the proposed action (6,681 acres). It must be recognized, however, that the area of land with the highest gamma radiation levels (44 uR/h) is 6,681 acres in the conventional plan and only 1,642 acres (above-grade clay

TABLE 3.3-5

ESTIMATED RADIOLOGICAL CHARACTERISTICS FOR RECLAIMED LANDS
(Sand/Clay Mix Plan)

Landform	Acreage	Gamma Radiation (uR/hr)	Soil Radium-226 (pCi/g)	Radon Flux (pCi/m$_2$/sec.)	Working Level (WL)
Sand Tailings Capped with Overburden	3,020	5 (4-7)	3 (2-4)	0.873	0.0082
Above-Grade Clay Settling Areas	1,642	44 (25-85)	22 (12-45)	4.38	0.0172
Sand/Clay Mix (2:1)	3,512	22 (16-34)	10 (7-17)	1.71	0.0112
Overburden Fill	1,740	5 (4-7)	1 (<1-2)	0.59	0.0068
Clay Capped with Sand/Clay Mix (2:1)	3,185	22 (16-34)	12 (8-22)	2.20	0.0125
Below-Grade Clay Settling Areas (Wetland)	2,095	(4-85)*	22 (12-45)	4.38	0.0172

Range is shown in ( ).

Calculation source for radon flux and working level: "National Radiation Exposure Assessment: Radioactivity of Lands and Associated Structures," Final Report Volume 2, February 1978, C.E. Roessler, J.A. Wethington, Jr., and W.E. Bolch.

Calculation source for gamma radiation: "National Council on Radiation Protection and Measurements" Natural Background in the United States, Report No. 45, November 1975.

Values for Radium-226 represent the top two feet of material. Calculated from soil characterization.

* The below-grade clay settling areas would be reclaimed as wetlands. The gamma radiation level would vary depending on the depth of water over the soil surface.

settling areas) for the sand/clay mix reclamation approach. Potential radiation exposure to the general public is thus lower for the sand/clay mix plan than for the conventional reclamation plan. The projected gamma radiation on 3,512 acres of 2:1 sand/clay mix (22 uR/hr) and 3,185 acres of clay capped with the sand/clay mix (25 uR/hr) is substantially greater than the interim exposure limit of 10 uR/hr. However, 1,740 acres of overburden fill (5 uR/hr) and 3,020 acres of sand tailings capped with overburden (5 uR/hr) are well within the recommended limit. The 2,095 acres of below-grade clay settling areas have an estimated gamma radiation level with a range of 4 to 85 uR/hr, depending on the depth of water present to attenuate gamma radiation.

With the sand/clay mix plan, a mixture of two-parts sand to one-part clay would be used to reduce the amount of conventional clay settling areas. As shown in Table 3.3-5, the 3,512 acres of sand/clay mix (10 pCi/g) and 3,185 acres of clay capped with sand/clay mix (12 pCi/g) would have predicted radium-226 concentrations significantly less than the 22 pCi/g for conventional clay settling areas. With the sand/clay mix alternative, the area used for conventional clay settling would be reduced to 1,642 acres from 6,681 acres under the proposed action. The below-grade clay settling areas would have an estimated soil radium-226 concentration of 22 pCi/g, and would be increased from 1,513 acres under the conventional plan to 2,095 acres. The lowest soil radium-226 concentrations under the sand/clay mix alternative would be an estimated 1 pCi/g for the 1,740 acres of overburden fill and 3 pCi/g for the 3,020 acres of sand tailings capped with overburden.

Agricultural use of reclaimed lands under the sand/clay mix plan would result in a lower potential for radium-226 uptake by crops since the uncapped clay settling areas with the highest level of radium-226 (44 pCi/g) total far fewer acres than in the conventional plan (1,642 acres versus 6,681 acres).

Overall, the estimated radon fluxes would be less for the sand/clay mix case than for the conventional case. The highest estimated radon flux, 4.38 $pCi/m^2/sec$, would occur on 1,642 acres of above-grade clay settling areas and 2,095 acres of below-grade clay settling areas. Much of the 6,681 acres of above-grade clay settling areas (4.38 $pCi/m^2/sec$) in the conventional plan would be replaced with 3,512 acres of sand/clay mix (1.71 pCi/m^2/sec) or the 3,185 acres of clay capped with sand/clay mix (2.20 pCi/m^2/sec). Although the area of overburden fill (0.59 pCi/m^2/sec) would be increased from 477 acres to 1,740 acres from the conventional plan, the amount of sand tailings areas capped with overburden (0.87 pCi/m^2/sec) would be decreased substantially, from 5,079 to 3,020 acres.

Overburden Mix Plan: Five land types would result from waste disposal and reclamation with this alternative: sand tailings capped with overburden (3,020 acres), overburden fill areas (1,740 acres), below-grade clay settling areas (2,095 acres), above-grade clay settling areas with sand/clay mix (2:1) cap (2,847 acres), and sand/clay mix (2:1) lands (5,492 acres).

Based on a maximum indoor radon progeny of 0.009 WL, a total of 4,760 acres of reclaimed land under this plan would be suitable for the construction of residences and public buildings (Table 3.3-6). This acreage includes 3,020 acres of sand tailings capped with overburden (0.0082 WL) and 1,740 acres of overburden fill (0.0068 WL). On the 5,492 acres of overburden sand/clay mix areas and on the 2847 acres of capped clay settling areas, the projected indoor radon progeny are 0.0126 WL, and 0.0125 WL, respectively, which means that mitigation measures would be required to allow construction. From this standpoint, the overburden mix case offers no advantage over the proposed action. The below-grade clay settling area of 2,095 acres has an estimated radon progeny of 0.0172 WL, which is high. It is unlikely that construction will be desirable in an area frequently inundated with water.

Under the overburden mix alternative, a total of 4,760 acres are expected to exhibit gamma radiation levels well below the 10 uR/hr interim limit. This area, comprised of 3,020 acres of sand tailings capped with overburden and 1,740 acres of overburden fill (both with an estimated gamma radiation level of 5 uR/hr), is smaller than the conventional case, where 7,000 acres are below the interim limit. The 2,095 acres of below-grade clay settling areas (4 to 85 uR/hr) could be expected to meet the interim limit when water levels sufficient to attenuate the gamma radiation are present. At times when water levels are low, this limit could be exceeded. The 5,492 acres of overburden

TABLE 3.3-6

ESTIMATED RADIOLOGICAL CHARACTERISTICS FOR RECLAIMED LANDS
(Overburden Mix Plan)

Landform	Acreage	Gamma Radiation (uR/hr)	Soil Radium-226 (pCi/g)	Radon Flux (pCi/m_2/sec)	Working Level (WL)
Sand Tailings Capped with Overburden	3,020	5 (4-7)	3 (2-4)	0.873	0.0082
Overburden Fill	1,740	5 (4-7)	1 (<1-2)	0.59	0.0068
Below-Grade Clay Settling Areas (Wetlands)	2,095	(4-85)*	22 (12-45)	4.30	0.0172
Overburden Sand/Clay Mix (2:1)	5,492	18 (13-32)	8 (5-16)	2.00	0.0126
Clay Settling Areas with Sand/Clay Mix (2:1) Cap	2,847	22 (16-34)	12 (8-22)	2.20	0.0125

Range is shown in ( ).

Calculation source for radon flux and working level: "National Radiation Exposure Assessment: Radioactivity of Lands and Associated Structures," Final Report Volume 2, February 1978, C.E. Roessler, J.A. Wethington, Jr., and W.E. Bolch.

Calculation source for gamma radiation: "National Council on Radiation Protection and Measurements" Natural Background in the United States, Report No. 45, November 1975.

Values for Radium-226 represent the top two feet of material. Calculated from soil characterization.

* The below-grade clay settling areas would be reclaimed as wetlands. The gamma radiation level would vary depending on the depth of water over the soil surface.

sand/clay mix would have an estimated level of 18 uR/hr, well above the interim limit. The 2,847 acres of clay settling areas with sand/clay mix cap would have an estimated level of 22 uR/hr, also well above the interim limit. The major difference between this alternative and the conventional clay settling case is the absence of above-grade conventional clay settling areas with their associated higher radiation levels. Thus, no areas under this plan would have gamma radiation levels as high as the 44 uR/hr of conventional clay settling areas, with the possible exception of the below-grade clay settling areas if they were to dry out.

With respect to agricultural use, the overburden mix case results in significantly lower soil radium-226 levels than conventional reclamation, reducing the potential for crop uptake of radium-226. As discussed earlier, however, studies by Mobil showed no significant radium-226 uptake on reclaimed lands with relatively high soil concentrations of this radionuclide. Soil radium-226 concentrations would range from an estimated 1 pCi/g for the 1,740 acres of overburden fill to 22 pCi/g for the 2,095 acres of below-grade clay settling areas. The 3,020 acres of sand tailings capped with overburden would have an estimated radium-226 value of 3 pCi/g. The overall radium-226 levels in the reclaimed lands for this case would generally be lower than for the proposed action.

On the average, radon fluxes would be lower for the overburden mix plan than the conventional plan. The 3,020 acres of sand tailings capped with overburden (0.87 $\text{pCi/m}^2\text{/sec}$), the 1,740 acres of overburden fill (0.59 $\text{pCi/m}^2\text{/sec}$), and the 2,095 acres of below-grade clay settling areas (4.38 $\text{pCi/m}^2\text{/sec}$) are comparable to the conventional plan. However, the 6,681 acres of above-grade clay settling areas (4.38 pCi/m2/sec) and the 1,489 acres of above-grade clay capped with sand tailings (2.05 $\text{pCi/m}^2\text{/sec}$) have been replaced by the 5,492 acres of overburden sand/clay mix (2.00 pCi/m2/sec) and 2,847 acres of clay settling areas with sand/clay mix cap (2.2 $\text{pCi/m}^2\text{/sec}$), an improvement over the conventional plan.

The radiological effects of the overburden mix case on groundwater and surface water are, for all practical purposes, identical to the proposed action.

3.3.2.2.4 Product Transport Alternatives

Railroad (Mobil's Proposed Action): Radiological impacts due to product transport should be minor. For transport by railroad, dust generation and spillage would be transient effects. Accidental spillage could occur but would be cleaned up and would not pose a significant radiological impact.

Truck: The use of trucks for transport would not have radiological effects significantly different from the use of railroad cars.

3.4 GROUNDWATER

3.4.1 THE AFFECTED ENVIRONMENT

3.4.1.1 Groundwater System

The groundwater system in southern Polk County consists of a water table aquifer and an artesian (confined) aquifer system. The water table aquifer is commonly referred to as the Shallow or Surficial Aquifer. The artesian aquifer system, or the Floridan Aquifer, is divided into two distinctive units commonly referred to as the Upper Floridan and Lower Floridan Aquifers. The Floridan Aquifer is one of the most productive aquifers in the United States, and is the principal source of potable water in the region. In the area of the proposed South Fort Meade Mine site, groundwater is used for irrigation, municipal, industrial and domestic supplies. Throughout the region, the artesian-surface elevation varies approximately five to fifteen feet during the year. These fluctuations are due to seasonal groundwater demands for irrigation, variations in aquifer recharge as a result of rainfall patterns and changes in barometric pressure.

Studies of the groundwater system were undertaken at the South Fort Meade site to identify the geologic sections and yield characteristics of the formations (Figure 3.4-A). At the site, the Surficial Aquifer was found to extend from near the surface to an average depth of 25 feet. Clayey units of the Hawthorn Formation and the silty and clayey portions of the undifferentiated clastics at the base of the surficial deposits separate the Surficial Aquifer from the Upper Floridan Aquifer. The Upper Floridan Aquifer was determined to consist

FIGURE 3.4-A

HYDROGEOLOGIC CROSS SECTION OF THE PROPOSED MINE SITE

STRATIGRAPHIC UNIT		APPROXIMATE THICKNESS IN FEET	AVERAGE DEPTH TO TOP OF UNIT IN FEET	AQUIFER & CONFINING UNITS	WATER-PRODUCING PROPERTIES
UNDIFFERENTIATED CLASTICS		45		SHALLOW AQUIFER	POOR TO MODERATE
HAWTHORN FORMATION		80	45	CONFINING UNIT	POOR
TAMPA FORMATION	LIMESTONE UNIT	105	125	UPPER FLORIDAN	POOR TO MODERATE
	SAND & CLAY UNIT	70	230	CONFINING UNIT	POOR
SUWANEE LIMESTONE		90	300	LOWER FLORIDAN	GOOD TO EXCELLENT
OCALA GROUP	CRYSTAL RIVER FORMATION WILLISTON FORMATION INGLIS FORMATION	340	390		
AVON PARK LIMESTONE	LIMESTONE UNIT	275	730		
	DOLOMITE UNIT	160	1005		
	LIMESTONE UNIT	240	1165		
LAKE CITY LIMESTONE			1405	CONFINING UNIT	POOR

SOURCE: STUDY DATA

of about 145 feet of dolomitic limestone interlayered with phosphatic sands and sandy clay. A sand and clay section of the Tampa Formation establishes a confining unit between the Upper and Lower Floridan Aquifers, although there is evidence of hydraulic communication between the two aquifers. The Lower Floridan Aquifer consists of permeable limestone and extends from 300 to 1,405 feet below the surface. The base of the Lower Floridan Aquifer is confined by the upper units of the Lake City Limestone, in which the pore spaces are filled or partially filled with evaporites. (Also see Section 3.2, Geology and Soils.)

3.4.1.2 Groundwater Quantity

3.4.1.2.1 Surficial Aquifer

The Surficial Aquifer is a source of small quantities of groundwater used for irrigation and domestic supply in the vicinity of the proposed mine site. The water level in the Surficial Aquifer remains approximately 50 feet or more above the piezometric surface of the Upper Floridan Aquifer (Figure 3.4-B). Under natural conditions, water from the Surficial Aquifer slowly recharges the underlying Upper Floridan Aquifer, and this water in turn is transmitted to the Lower Floridan Aquifer.

The Surficial Aquifer at the site was further defined during the study period (January to August, 1980) by data from 10 wells summarized as follows:

- Level of water table
    - Average depth below surface - 10.5 ft
    - Range of depth below surface - 2 ft to 37 ft
    - Average fluctuation per well - 4.3 ft
- Leakance - 1 x 10^{-4} gpd/ft^3
- Transmissivity - 11 to 43 gpd/ft
- Permeability - 0.96 gpd/ft^2 or 4.5 x 10^{-5}cm/sec
- Yield - small, less than 1 gpm

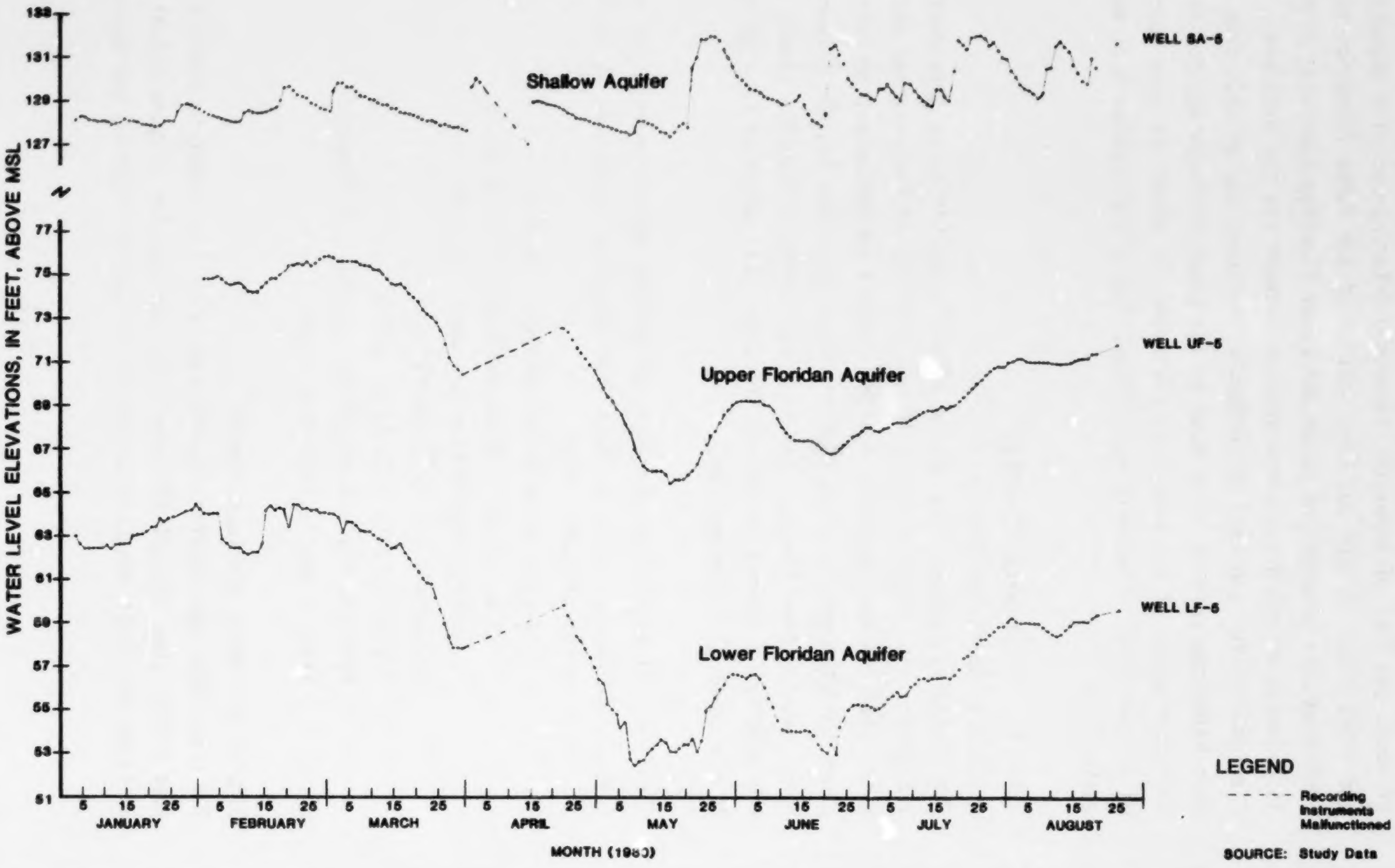
3.4.1.2.2 Upper Floridan Aquifer

The Upper Floridan Aquifer is artesian, with a piezometric surface about 10 feet higher than that of the Lower Floridan Aquifer (Figure 3.4-B). It is utilized for local domestic and small irrigation supplies and commonly yields

FIGURE 3.4-B

GRAPH OF WATER LEVEL FLUCTUATIONS

IN WELLS SA-5, UF-5 AND LF-5, JANUARY TO AUGUST 1980



SOURCE: Study Data

from a few tens of gallons per minute to several hundreds of gallons per minute. The low transmissivity of the aquifer makes it extremely difficult to develop large quantities of water.

A summary of the Upper Floridan Aquifer characteristics on the Mobil site defined during the study period are presented below:

- Water level (piezometric surface)
    - Average depth below surface - 64.5 ft
    - Range of depth below surface - 33.7 ft to 97.6 ft
    - Average fluctuation - 12 ft
    - Average aquifer thickness - 145 ft
- Average Aquifer Depth - 85 ft to 230 ft below surface
- Transmissivity - 10,000 gpd/ft
- Leakance - 2 x 10^{-3} gpd/ft^3 (Upper Floridan to Lower Floridan)
- Permeability - 69 gpd/ft^2 or 3.25 x 10^{-3} cm/sec
- Yield - 20 to 200 gpm

3.4.1.2.3 Lower Floridan Aquifer

The Lower Floridan Aquifer, also artesian, is the source of most large, potable groundwater withdrawals in Polk County, Florida. Wells penetrating this aquifer are commonly capable of producing several million gallons per day. At the site, water levels in the Lower Floridan Aquifer fluctuate about 12 feet from the dry season to the wet season (Figure 3.4-B). These fluctuations are the result of natural phenomena such as baseflow support to streams, leakage into the Upper Floridan Aquifer, barometric pressures, evapotranspiration and seasonal rainfall, as well as pumpage from the groundwater system. Industrial pumping remains relatively stable throughout the course of a year, whereas withdrawals for irrigation may vary from season to season and even from year to year (EPA, 1978).

Pumping tests conducted at the proposed mine site indicated that large quantities of water can be withdrawn from the Lower Floridan Aquifer. The aquifer's hydrologic properties of transmissivity, storativity and leakance, as determined by the study, compare favorably with those determined in regional studies conducted by the U.S. Geological Survey (Wilson, 1980).

Characteristics of the Lower Floridan Aquifer defined during the study period are summarized below:

- Water level (piezometric surface)
  - Average depth below surface - 71 ft
  - Range of depth below surface - 52 ft to 84 ft
  - Average fluctuation - 12 ft
- Average Aquifer Thickness - 1,105 ft
- Average Aquifer Depth - 300 ft to 1,405 ft below surface
- Transmissivity - 1,300,000 gpd/ft^2
- Leakance - very low permeability (base of Lower Floridan)
- Permeability - 1,176 gpd/ft^2 or 5.55×10^{-2} cm/sec
- Yield - up to several mgd per well

3.4.1.3 Groundwater Quality

On a regional basis, water from the Floridan Aquifer is of suitable quality to be utilized for potable water supplies, for industrial processing requirements and for agricultural irrigation. Regional groundwater quality is relatively consistent in the Floridan Aquifer except for certain areas along the Gulf of Mexico where saltwater intrusion has been experienced, and beneath the potable zones of the Floridan Aquifer where incomplete flushing of the natural system or the presence of certain minerals has left highly mineralized water.

3.4.1.3.1 Surficial Aquifer

The quality of groundwater in the Surficial Aquifer varies considerably in the region due to local lithologic conditions. Water in the Surficial Aquifer at the South Fort Meade site is generally high in iron concentration (0.1 to 6.3 mg/l) and has a pH value less than seven. Data from nine test wells sampled on the site are presented in Table 3.4-1 along with EPA drinking water standards and Florida Class B standards.

3.4.1.3.2 Upper Floridan Aquifer

The chemical composition of the water from the Upper Floridan Aquifer at the proposed mine site (Table 3.4-1) is similar to that from wells penetrating the

TABLE 3.4-1

CHEMICAL ANALYSIS OF WATER FROM THE SHALLOW AQUIFER[1]

Constituent	Florida Groundwater[6] Class 1-8 Standards	Drinking Water Standard[2]	SA-2 9-26-80	SA-3 9-26-80	SA-4 9-25-80	SA-5 9-25-80	SA-6 2-28-80	SA-6 9-25-80	SA-7 9-26-80	SA-9 9-25-80	SA-10 9-25-80	SA-5 9-25-80
Conductivity (umho)/cm)[3]	-	-	56	225	180	480	190	135	60	90	170	225
pH[3]	-	6.5-8.5 R	5.50	5.95	6.70	8.45	7.50	5.50	5.65	6.45	6.86	6.15
Temperature (°C)[3]	-	-	27	29	29	28	-	27	26	26	28	29
Acidity ($CaCO_3$)	-	-	8	7	3	5	6	14	7	6	7	11
Total Alkalinity ($CaCO_3$)	-	-	12	22	75	161	72	31	10	25	39	67
Total Solids ($CaCO_3$)	-	-	1470	191	118	348	138	104	148	716	120	176
Total Dissolved Solids	-	500 R	-	-	-	-	134	-	-	-	-	-
Color (PCU)	-	15 R	1000	150	5	70	25	30	200	500	15	200
Fluoride (F)	1.5	1.4-2.8 M	0.12	0.46	0.28	3.8	0.49	0.50	0.30	0.43	0.53	0.28
Total Phosphorus	-	-	13.4	0.36	0.33	0.45	0.75	1.10	1.04	1.33	0.06	0.15
Ortho-Phosphate (PO_4)	-	-	0.38	0.20	0.27	0.42	0.70	1.02	0.34	0.91	0.59	0.03
Organic Nitrogen	-	-	0.56	0.15	0.04	1.78	0.3[4]	0.77	0.49	0.69	0.12	0.16
Ammonia (NH_3)	-	-	0.28	0.20	0.26	3.1	0.11	0.14	<0.10	<0.10	0.21	0.48
Nitrate (NO_3)	10.0	10.0 M	<0.02	0.13	<0.02	<0.02	<0.1	<0.02	0.4	0.25	2.1	<0.02
Nitrite (NO_2)	-	-	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silica (SiO_2)	-	-	10.7	15.0	19.7	6.9	12.8	16.1	8.2	9.6	9.1	7.8
Sulfate	-	250 R	<1.0	35.4	2.5	19.6	7.9	1.9	1.0	6.6	11.5	9.8
Total Organic Carbon (mg C/l)	-	-	12.8	6.5	1.0	23.2	63.8	1.3	2.3	6.5	2.7	7.6
Aluminum (AL)	-	-	16.7	3.90	<0.40	0.66	0.57	0.88	7.69	2.5	1.20	1.20
Arsenic (As)	0.05	0.05 M	<0.06	<0.05	<0.06	<0.05	<0.06	<0.05	<0.06	<0.05	<0.06	<0.06
Barium (Ba)	1.0	1.0 M	0.2	<0.1	<0.1	<0.01	0.31	<0.01	<0.01	0.3	<0.01	<0.01
Cadmium (Cd)	0.01	0.01 M	0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	0.01	0.01	0.01
Calcium (Ca)	-	200 R	4.41	9.85	10.9	41.7	22.2	9.60	4.73	10.1	15.7	13.1
Chromium (Cr)	0.05	0.05 M	<0.04	<0.04	<0.04	<0.04	<0.06	<0.04	<0.04	0.06	<0.04	<0.04
Copper (Cu)	-	1.0 R	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Iron (Fe)	-	0.3 R	3.45	1.58	0.11	0.10	1.95	2.04	1.61	4.59	0.04	6.28
Lead (Pb)	0.05	0.05 M	0.2	<0.01	0.1	<0.01	0.07	<0.01	0.1	<0.1	<0.01	<0.01
Magnesium (Mg)	-	125 R	8.83	5.04	9.93	1.34	6.2	3.47	1.66	2.76	4.81	5.36
Mercury (Hg)	0.002	0.002 M	<0.001	<0.001	<0.001	<0.001	<0.001	<0.006	<0.001	<0.001	<0.001	<0.001
Nickel (Ni)	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Potassium (K)	-	-	0.878	0.890	0.728	3.39	0.960	0.372	0.388	3.54	0.995	1.61
Selenium (Se)	0.01	0.01 M	<0.01	<0.01	<0.01	<0.01	<0.004	<0.01	<0.01	<0.01	<0.01	<0.01
Silver (Ag)	0.05	0.05 M	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Sodium (Na)	-	200 R	63.1	38.0	23.6	73.8	11.4	18.4	24.5	21.5	14.8	36.7
Strontium (Sr)	-	-	0.578	0.58	<0.01	1.86	0.76	<0.10	0.33	1.67	0.31	0.54
Chloride (Cl)	-	250 R	-	13.0	-	-	13.0	-	-	-	-	-
Pesticide Scan	-	-	ND5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Oil and Grease	-	-	-	-	-	-	<0.2	-	-	-	-	-
Total Hardness ($CaCO^3$)	-	-	-	-	-	-	88	-	-	-	-	-
Gross Alpha PiCo Curries/l	15.01	15.0	26.3 ± 7.3	<5.4	<2.3	6.6 ± 6.3	<8.4	-	<4.1	97 ± 16.7	<0.9	4.8 ± 4.6
Radium 226	-	-	9.8 ± 0.4	1.1 ± 0.1	-	1.8 ± 0.2	-<0.4	-	-	14.6 ± 0.5	-	1.1 ± 0.1

All constituents are in mg/l except pH and those noted.

1 Well SA1 was not sampled due to depth of water.

2 Environmental Protection Agency Primary and Secondary Standards (Partial List); M (Mandatory) R (Recommended).

3 Field measurements, except 2-28-80 sample.

4 Total Kjeldahl Nitrogen.

5 None detected.

6 Includes all groundwater with total dissolved solids less than 10,000 mg/l. FAC Chapter 17.3.

SOURCE: STUDY DATA

same aquifer at the Estech Duette Mine and the CF Industries Hardee County Mine. The water in the Upper Floridan Aquifer is more mineralized than that found in the Shallow Aquifer, particularly with respect to constituents derived from the carbonate rock making up the Upper Floridan Aquifer. The parameters showing higher values are sulfate, calcium, alkalinity, total hardness and total dissolved solids.

3.4.1.3.3 Lower Floridan Aquifer

Water found in the Lower Floridan Aquifer at the site is also of similar quality to that found at the Estech Duette Mine, at CF Industries Hardee County Mine, and at other locations in the region. The upper and middle sections of the aquifer contain potable water, but below 1,200 feet increased mineralization is evident. The mineral content increases with depth through the lower section due to the dissolution of naturally occurring sulfate minerals known to exist in that section of the aquifer. Table 3.4-1 shows the results of chemical analysis of the water collected at the end of the 10-day pumping test of the Lower Floridan Aquifer.

3.4.2 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

3.4.2.1 The No Action Alternative

Under the no action alternative groundwater would continue to be used for irrigation, municipal, industrial and domestic supplies in the area of the proposed mine. Seasonal changes in water levels of the Surficial, Lower Floridan and Upper Floridan Aquifers would not be affected. The hydrologic characteristics of the Surficial Aquifer would not be altered, nor would recharge to the Floridan Aquifer change. The quality of groundwater in the region is presently suitable for potable water supplies, industrial processing and irrigation and would not be changed as a result of the no action alternative.

3.4.2.2 The Action Alternatives Including the Proposed Action

3.4.2.2.1 Mining Method Alternatives

Dragline (Mobil's Proposed Action): The dragline method would require a relatively dry pit for effective mining. To attain this condition, dewatering of the Surficial Aquifer would be necessary, temporarily lowering water table levels adjacent to the pit. Based on aquifer properties determined in the baseline study, an average Surficial Aquifer thickness of 25 feet, and an average pit bottom 45 feet below land surface, a drawdown of one foot (using the Dupuit method described in Todd, 1959) is expected 115 feet from the perimeter of the open pit. Perimeter rim ditches identified in Mobil's proposed action would negate off-site drawdowns in the water table aquifer.

The dewatering for dragline mining would affect the recharge to the Floridan Aquifer system as a result of lowering the Surficial Aquifer water table in the vicinity of the mine pit an average of 38 feet. Utilizing the aquifer properties determined in the baseline study, it is calculated that the natural recharge over the project site of three inches per year would be reduced by about 0.1 inch per year as a result of dewatering activities.

Bucket Wheel: The bucket wheel method of mining would require a totally dry pit, a condition difficult to attain during the rainy summer months. Additional dewatering beyond that needed for the dragline would be required. Impacts from the bucket wheel method, other than those associated with dewatering, would be similar to the dragline mining method.

Dredge: The dredge mining method would require flooding of the mining area. Groundwater from the Lower Floridan Aquifer would be used to maintain the necessary water levels in the dredge pit. This increased pumping would serve to further lower the piezometric level in the Lower Floridan Aquifer. During overburden removal, the water level in the pit would be maintained and would, therefore, have no dewatering effect on the Surficial Aquifer. During matrix removal the water level would be lowered and maintained above the top of the matrix, temporarily dewatering the upper zones of the Surficial Aquifer in the immediate vicinity of the dredge basin.

During overburden removal there would be no effect on natural recharge. During ore extraction, however, the reduction in natural recharge for the total site would be about 0.03 inches per year or one-third of that calculated for the dragline mining method.

Mining by dredge would increase turbidity and suspended solids content in the recirculation system. Because leach zone management could not be practiced with this mining method, radioactive particles attached to the suspended solids could result in increased radiation levels in the water recirculation system.

3.4.2.2.2 Matrix Transfer Alternatives

Pipeline (Mobil's Proposed Action): The matrix would be slurried at the mining area and transferred to the beneficiation plant by pipeline, requiring approximately 18,750 gpm of slurry transport water and 480 gpm of pump seal water. The slurry transport water would be recycled water obtained from the recirculation system. The pump seal water source would be from wells drilled into the Upper Floridan Aquifer, and withdrawal points for this water would change as mining progresses. The changes to the piezometric levels would be temporary, ceasing with the completion of mining.

Conveyor Belt: Transporting the matrix to the beneficiation plant by conveyor belt would involve placement of the matrix onto the conveyor without the addition of water. However, recycled water would still be needed for the conveyor method as washing water once the matrix reaches the beneficiation plant. The quantity of recycled water required for the conveyor belt method of transport would be approximately equivalent to the pipeline transfer method. The pump seal water requirement (480 gpm) would be eliminated because the booster pumps would not be needed.

Truck: Truck transport of the matrix would eliminate the need for pump seal water (480 gpm), but as with conveyor belt transport, overall water requirements would not be reduced due to the need for matrix processing water.

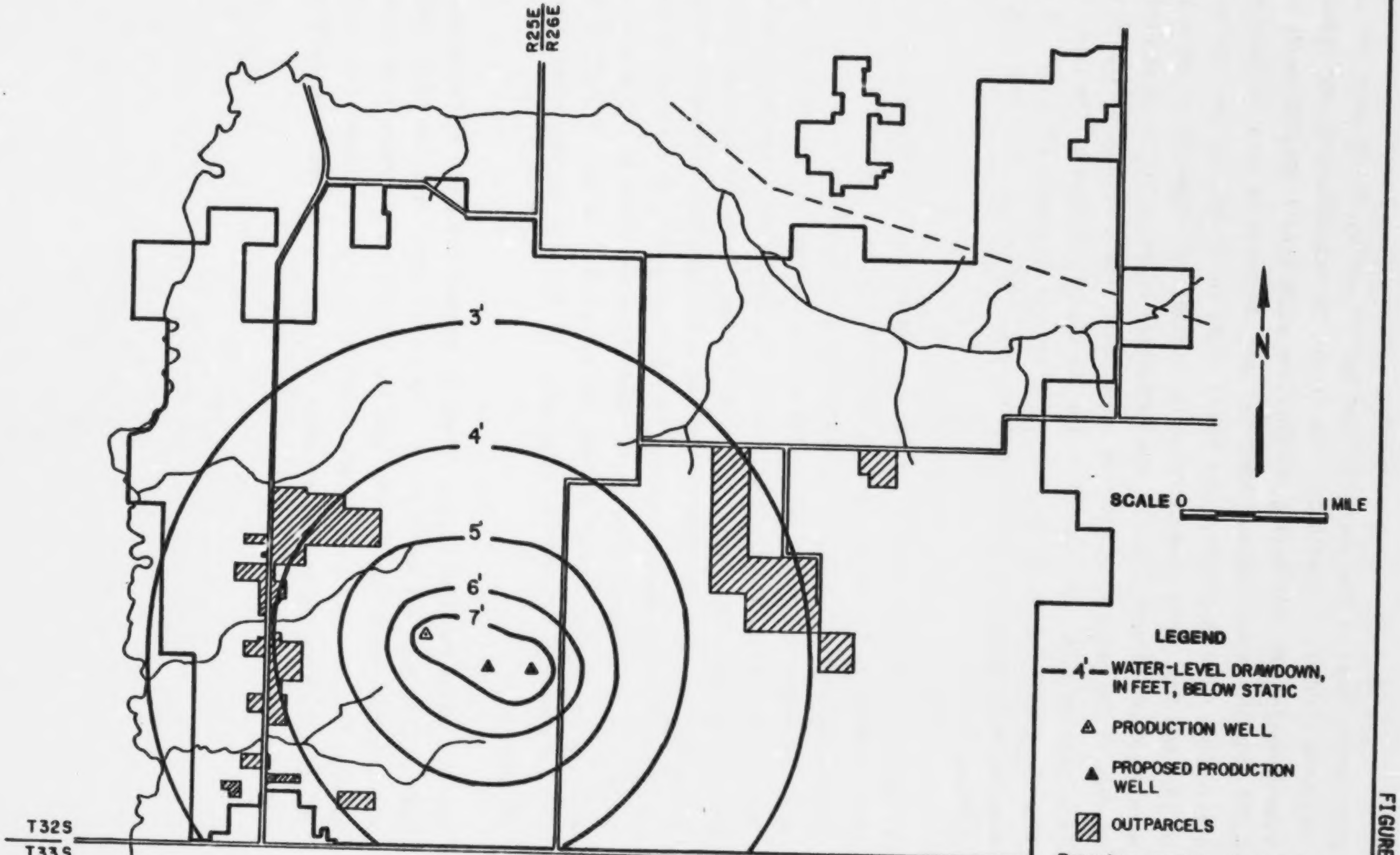
3.4.2.2.3 Processing Alternatives

Conventional Beneficiation (Mobil's Proposed Action): The conventional beneficiation process would utilize up to 130 mgd of water from the recirculation system, and 15.7 mgd of flotation process water and makeup water obtained from the Lower Floridan Aquifer. This groundwater withdrawal would lower the piezometric level of the Lower Floridan Aquifer during the 25 years the beneficiation plant is in operation. The values for transmissivity and leakance determined for the site during the baseline study were 1,300,000 gpd/ft and 0.002 gpd/ft^3, respectively. Using the more conservative data included in the application for a Consumptive Use Permit (CUP) to SWFWMD, and the pumping rate of 15.7 mgd from three production wells, contours of projected drawdown levels were developed (Figure 3.4-C). The calculated drawdown in the piezometric surface at the property boundaries would range from a maximum of 4.3 feet to less than one foot. The change in the piezometric surface of the Lower Floridan Aquifer would be temporary. At the end of mining activity, the pumping would cease and the piezometric level should return to premining conditions.

Withdrawals from the artesian groundwater system could potentially cause upward movement of the higher sulfate water located near the bottom of the Lower Floridan Aquifer. The higher sulfate water occurs naturally in and slightly above the evaporite zone. During the 10-day pumping test at the site, an increase in the sulfate concentration of the discharged water was observed. After seven days, the concentration of sulfates stabilized at about 530 mg/l. Throughout the test the chloride concentration remained essentially constant at 12.5 mg/l. Any movement of the high sulfate water, as a result of the continuous groundwater withdrawals, would be noted first in the production wells at the project site. The monitoring required as part of Mobil's CUP from SWFWMD would demonstrate if movement of the high sulfate water were occurring.

Reagents would be added in the flotation process and would be discharged with the sand tailings and waste clays. The excess water from the waste sand and clay disposal areas would drain into the recirculation system from which some seepage into the Surficial Aquifer would occur via the ditches and canals. The impact on Surficial Aquifer water quality is discussed in Waste Disposal (Section 3.4.2.2.4).

LOWER FLORIDAN AQUIFER DRAWDOWN PROJECTION


R25E
R26E
3'
4'
5'
6'
7'
N
SCALE 0
1 MILE
LEGEND
4' WATER-LEVEL DRAWDOWN, IN FEET, BELOW STATIC
△ PRODUCTION WELL
▲ PROPOSED PRODUCTION WELL
▨ OUTPARCELS
T32S
T33S

Drawdown contours based on a total pumping rate of 16.7 MGD from three wells.

SOURCE: MOBIL

FIGURE 3.4-C

Dry Separation: The dry separation method of processing would not utilize the large quantities of water required by the conventional beneficiation method. Due to the small amounts of water required for this method of processing, impacts on the artesian system would be negligible. No chemicals would be used in the beneficiation process; therefore, groundwater quality would not be affected by this alternative.

3.4.2.2.4 Waste Disposal Alternatives

Conventional Clay Settling Case (Mobil's Proposed Action): Mobil proposes to dispose of the waste sand and clay in conventional clay settling and sand tailing disposal areas. As the mined areas are filled with waste materials or as the wastes are stored above natural grade, a new shallow aquifer would be established. In the clay settling areas (9,683 acres), the elevation of the water table would be at or above the top of the clays. As the clays compact, water would be decanted and returned to the recirculation system, lowering the water table. As the elevation of the fill in the clay settling areas rises above the level of the surrounding Shallow Aquifer, the water level would rise in the adjacent water table system.

In the tailings disposal areas (5,034 acres), the sand would permit rapid drainage, allowing the water table to re-establish at a level dependent on the hydrologic characteristics of the surrounding materials. Groundwater in the Surficial Aquifer would have preferential flow in areas of high permeability such as the sand tailings fill areas. Sand tailings disposal areas, which do not retain water like waste clay, would have little impact on water levels in the Surficial Aquifer, tending to maintain levels similar to those found in natural conditions.

The greatest consumption of water in the mining operation is water that becomes entrained with the waste clays and sand. Approximately 11.6 mgd of water would be entrained in the waste clay disposal areas and 1.7 mgd of water would be entrained in the sand tailings disposal areas.

As waste disposal progresses, recharge to the artesian aquifer would decrease as the number of waste clay areas increases. Using the final average above-grade clay fill height of 32.8 feet and 9,683 acres of clay settling area, the calculated recharge to the artesian aquifer from the clay settling areas would be 0.1 inches/year. This would reduce the weighted average recharge for the total site from three inches to about 1.6 inches per year.

Water in the recirculation system may contain contaminants from contact with the ore matrix and from the reagents used in the flotation process. Many of these contaminants would become entrained with the clays or would be biologically degraded. Seepage from the clay settling areas and the sand tailings disposal areas would average 2.7 mgd and would result in minor changes of water quality in the Surficial Aquifer. A comparison of the quality of Surficial Aquifer water to that of the water quality of projected clay settling area supernatant is presented in Table 3.4-2. The clays in the clay settling areas should form a natural seal, reducing seepage from these areas.

Sand/Clay Cap Case: The sand/clay cap waste disposal case is similar to the conventional clay settling disposal case except that a five foot mixture of sand/clay (4:1) material would be placed on 7,580 acres of clay settling areas. This method of waste disposal would have impacts on the groundwater system similar to that of the proposed action.

Sand/Clay Mix Case: The sand/clay mix case would have 3,512 acres of sand/clay mix areas, 3,185 acres of clay capped with sand/clay mix and 1,642 acres of clay settling areas. The two to one mixture of sand and clay does not significantly increase the permeability of the mixture from that of clay. Seepage from the sand/clay mix waste disposal areas into the Surficial Aquifer would be increased slightly. The amount of water retained in the waste disposal areas would be reduced when the clays are mixed with sand. For the sand/clay mix case, this reduction would be approximately half a million gallons per day relative to the conventional case (from 11.6 mgd to 11.1 mgd).

TABLE 3.4-2

COMPARISON OF THE WATER QUALITY OF SHALLOW AQUIFER WATER TO TYPICAL VALUES IN CLAY SETTLING AREA SUPERNATANT

Constituents[a]	Surficial Aquifer[b]	Clay Settling Area Supernatant[c]
pH, pH units	5.5-8.5	7.8
Specific Conductance, mhos/cm	181	523
Total Dissolved Solids	134	348
Calcium	<0.04	57
Magnesium	4.94	22
Sodium	32.6	18
Potassium	1.06	1.3
Bicarbonate	-	112
Sulfate	9.4	144
Chloride	13	17
Iron	2.18	0.119
Silica	11.6	2.5
Fluoride	0.72	2.0
Nitrate (NO_3)	0.28	4.7
Phosphorus	1.98	0.09
Radium-226, pCi/l	<1-14.6	0.67

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[a] Units are mg/l unless otherwise noted.

[b] Average of analyses from Shallow Aquifer wells on the South Fort Meade site, 2/28/80 and 9/25/80.

[c] Lamont, et al. 1975. Characterization Studies of Florida Phosphate Slimes.

Overburden/Clay Mix Case: The overburden/clay mix disposal case would contain 5,492 acres of sand/clay mix (2:1) areas and 2,847 acres of clay settling areas capped with sand/clay mix. This waste disposal alternative would have potential impacts on the groundwater system similar to the sand/clay mix waste disposal alternative.

3.4.2.2.5 Reclamation Alternatives

Conventional Clay Settling Plan (Mobil's Proposed Action): During mining operations, the waste products of the beneficiation process (clays and sand tailings) would be disposed of in mine cuts and above-ground storage areas. With the completion of mining operations and waste disposal activities, a shallow groundwater level would be established in these waste materials dependent on the nature of the waste products in conjunction with topography. The clay materials in clay disposal areas (9,683 acres) would retain water at or near the top of the clays. In the sand tailings disposal areas (5,034 acres), the sand would allow water to drain to a level dependent on the hydrologic characteristics of the sand and adjacent materials. In the proposed reclamation plan, the sand tailings disposal areas would primarily be along existing streams. This would provide transitional zones between high water levels of the waste clay settling areas and the streams.

The premining flow of water through the Surficial Aquifer would change as a result of the formation of clay disposal areas. After reclamation, groundwater in the Surficial Aquifer that would have moved through the site would be blocked and diverted by the 9,683 acres of waste clay. This water would become additional base flow to streams near the mine, thereby increasing evapotranspiration and raising the head in the water table upgradient of the site and recharge at that point to the artesian system.

The conventional reclamation plan would reduce recharge to the artesian aquifer from the South Fort Meade site as a result of the disposal of waste clays which have a lower permeability than the premining materials. A reduction in recharge to 0.1 inches/year at the clay storage areas was calculated using the hydrologic properties from the baseline study and an estimated waste clay permeability of 0.0002 gpd/ft^2 (Bromwell, 1976). Although the water level in the Shallow Aquifer would be increased an average of 32.8 feet, a 1.4 inch/year average reduction of the recharge to the artesian aquifer would still occur over the property (i.e., from 3 to 1.6 inches/year).

Water from the waste disposal areas could potentially enter the Surficial Aquifer system. The sand tailings and waste clays would contain naturally occurring contaminants from the phosphate matrix and residual reagents used in the flotation process. Groundwater withdrawn from the Surficial Aquifer in reclaimed areas may contain some of these contaminants.

Sand/Clay Cap Plan: The sand/clay cap reclamation plan would have 7,580 acres of above-grade clay settling areas capped with five feet of sand/clay mix (4:1) material, 590 acres of above-grade clay settling basins capped with overburden, 1,513 acres of below-grade clay settling basins, and 5,079 acres of sand tailings fill areas capped with overburden. The basin sizes and configurations would be approximately the same as the proposed conventional plan.

The sand/clay mix material at a 4:1 ratio would have a permeability greater than the clay alone; therefore, vertical and horizontal water movement in the five-foot sand/clay cap would be greater than the water movement in the clay. This would allow a perched water table to be established about five feet below the surface of the sand/clay cap areas (7,580 acres).

The below-grade clay settling areas (1,513 acres) would be developed as wetlands. The water table level in these areas would be near the surface. The 590 acres of above-grade clay settling basins capped with overburden would have a perched water table in the overburden cap.

The sand tailings fill areas (5,070 acres) would have a high permeability, allowing rapid drainage and establishment of the Surficial Aquifer water table at a level dependent upon the adjacent materials. As with the proposed conventional plan, the sand tailings fill areas would be primarily located along existing stream channels and would provide transitional zones between the high water table levels of the above-grade clay settling areas and the streams.

The sand/clay cap reclamation plan would have impacts on the regional Surficial Aquifer system, natural recharge rates and Surficial Aquifer water quality similar to that of the proposed conventional plan.

Sand/Clay Mix Plan: The sand/clay mix plan would have 3,512 acres of sand/clay mix (2:1), 3,185 acres of conventional clay settling areas with sand/clay mix (2:1) cap, 2,095 acres of below-grade clay settling areas, 1,642 acres of above-grade clay settling areas, 1,740 acres of overburden fill and 3,020 acres of sand tailings fill with overburden cap. The dike configurations would be similar to those of the proposed action.

The permeability of the 2:1 sand/clay mix material would be slightly greater than that of clay alone, resulting in a small increase in recharge to the artesian aquifer for the sand/clay mix plan compared to the proposed conventional plan. The water retention capabilities of the reclaimed sand/clay mix materials would be essentially the same as clay. The re-establishment of the water table in the 3,512 acres of sand/clay mix areas would be dependent on the hydrologic gradient of the sand/clay mix and the adjacent materials.

The 3,185 acres of clay settling areas with sand/clay mix (2:1) cap would develop a perched water table about five feet below the surface at the interface of the clay and sand/clay mix material.

The above-grade and below-grade clay settling areas would retain water at or near the surface. The areas would reduce natural recharge as described for the proposed action.

The overburden fill areas and sand tailings fill areas would have high permeabilities that would allow rapid drainage. The effects of these areas on the groundwater system would be the same as those described for the sand tailings fill areas under the conventional clay settling plan.

The sand/clay mix reclamation plan would have impacts on the regional Surficial Aquifer and local Surficial Aquifer water quality similar to that of the proposed conventional plan.

Overburden Mix Plan: The overburden mix plan would have 5,492 acres of sand/clay mix (2:1) areas, 2,847 acres of clay settling areas with sand/clay mix (2:1) cap, 2,095 acres of below-grade clay settling areas, 1,740 acres of overburden fill areas, and 3,020 acres of sand tailings fill areas capped with overburden. The dike configuration would be the same as the sand/clay mix plan.

The 5,492 acres of sand/clay mix areas would have the same impacts on the groundwater system as the sand/clay mix areas described under the sand/clay mix plan. The sand/clay mix (2:1) areas would have a permeability slightly greater than clay; therefore, the effects on the groundwater system would be slightly greater natural recharge than for clay settling areas. The amounts of below-grade clay settling areas, sand tailings fill areas and overburden fill areas are equivalent to the sand/clay mix plan acreages. Therefore, the overburden mix plan would have approximately the same impacts on groundwater as the sand/clay mix plan, except there would be slightly greater natural recharge.

3.4.2.2.6 Water Source Alternatives

Groundwater (Mobil's Proposed Action): During the 25 years of mining activity, water would be withdrawn for water supplies from the Lower Floridan Aquifer (15.7 mgd) and from the Upper Floridan Aquifer (0.731 mgd), and for dewatering purposes from the Surficial Aquifer. The withdrawals would lower the water level in both the artesian and shallow aquifers, and would alter the recharge from the shallow to the artesian aquifer. The effect of these groundwater withdrawals has been discussed under previous sections (Mining Methods, Matrix Transfer and Processing). The effects of the withdrawal rates have been evaluated by SWFWMD through CUP No. 205403 and the proposed withdrawal rates were approved.

Recharge to the artesian aquifer from the Surficial Aquifer would be affected both by lowering the water level in the artesian aquifer by pumpage and by dewatering the Surficial Aquifer. The 15.7 mgd of groundwater withdrawn from the Lower Floridan Aquifer would lower the piezometric surface beneath the site an average of 3.3 feet. This drawdown would cause an increase in recharge to the artesian system underlying the total area of the proposed mine site of about 0.2 inches/year. A local reduction in recharge due to dewatering for mining operations would occur in the areas being mined. Calculations using the aquifer characteristics determined in the baseline study indicate that lowering the water table 38 feet by dewatering would decrease the recharge to the artesian aquifer 0.7 inches/year in the area of the mining pit. The changes in recharge due to groundwater withdrawals and pit dewatering are about equal per unit area and opposite in effect; therefore, little overall change in recharge to the artesian aquifer due to these activites would occur.

Surface Water: If surface water were used for water supply, the piezometric surface and water quality of the artesian aquifer would not be affected by withdrawals of groundwater. Dewatering operations would be required to keep the mine pit dry; therefore, the impacts to the water level and water quality of the Surficial Aquifer would be the same as described for the proposed action. When active mining ceases, the net impact on recharge would be the same as for the proposed action.

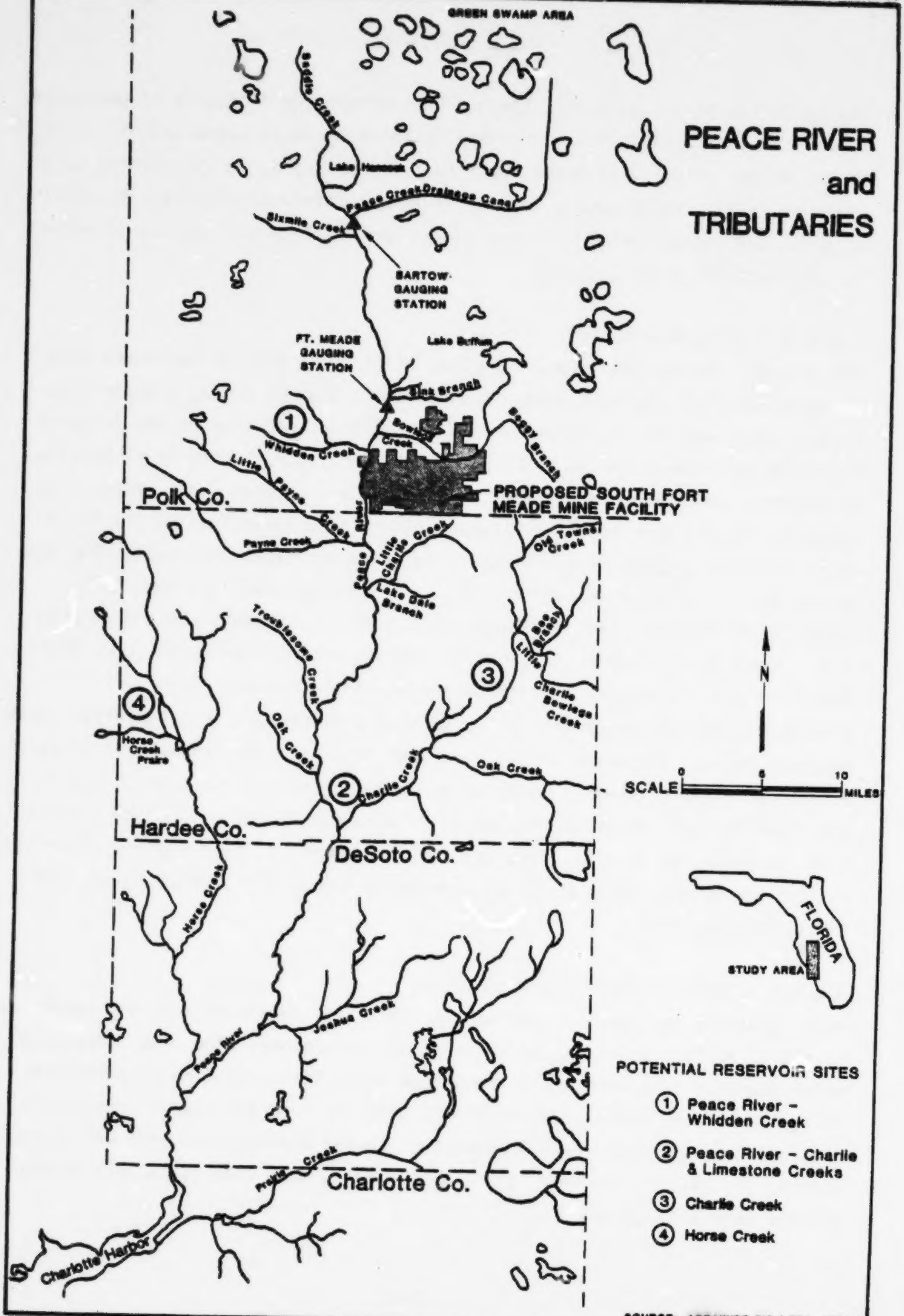
3.5 SURFACE WATER

3.5.1 THE AFFECTED ENVIRONMENT

3.5.1.1 Regional Description

The Peace River originates from several lakes in the Green Swamp area of central Polk County and flows in a general southwesterly direction through Polk, Hardee, DeSoto, and Charlotte Counties for approximately 105 miles, entering the Gulf of Mexico at Charlotte Harbor (Figure 3.5-A). Under average flow conditions the river width varies from 60 feet to 200 feet and the depth varies from 1.5 feet to 10 feet. River flows fluctuate widely with high flows typically occurring from late summer to early fall and low flows occurring in the

FIGURE 3.5-A


PEACE RIVER and TRIBUTARIES
GREEN SWAMP AREA
Saddle Creek
Lake Hancock
Peace Creek Drainage Canal
Sixmile Creek
BARTOW GAUGING STATION
FT. MEADE GAUGING STATION
Lake Buffum
Sink Branch
Bowlegs Creek
Whidden Creek
Little Payne Creek
Peace River
Bear Branch
PROPOSED SOUTH FORT MEADE MINE FACILITY
Polk Co.
Payne Creek
Little Charlie Creek
Old Town Creek
Lake Dale Branch
Troublesome Creek
Oak Creek
Buck Branch
Little Charlie Bowlegs Creek
Horse Creek Praire
Charlie Creek
Oak Creek
Hardee Co.
DeSoto Co.
Horse Creek
Joshua Creek
Peace River
Prairie Creek
Charlotte Co.
Charlotte Harbor
N
SCALE
0
5
10
MILES
FLORIDA
STUDY AREA
POTENTIAL RESERVOIR SITES
① Peace River - Whidden Creek
② Peace River - Charlie & Limestone Creeks
③ Charlie Creek
④ Horse Creek
①
②
③
④

SOURCE: AREAWIDE EIS (EPA, 1978)

spring during March and April; these flows reflect the influence of precipitation cycles. The Peace River drainage basin encompasses approximately 2,300 square miles. Mobil's proposed South Fort Meade Mine is located within this drainage basin. Point source discharges and runoff from agricultural, silvicultural and recreational land uses affect the quantity and quality of water in the Peace River (EPA, 1978).

3.5.1.2 Site Description

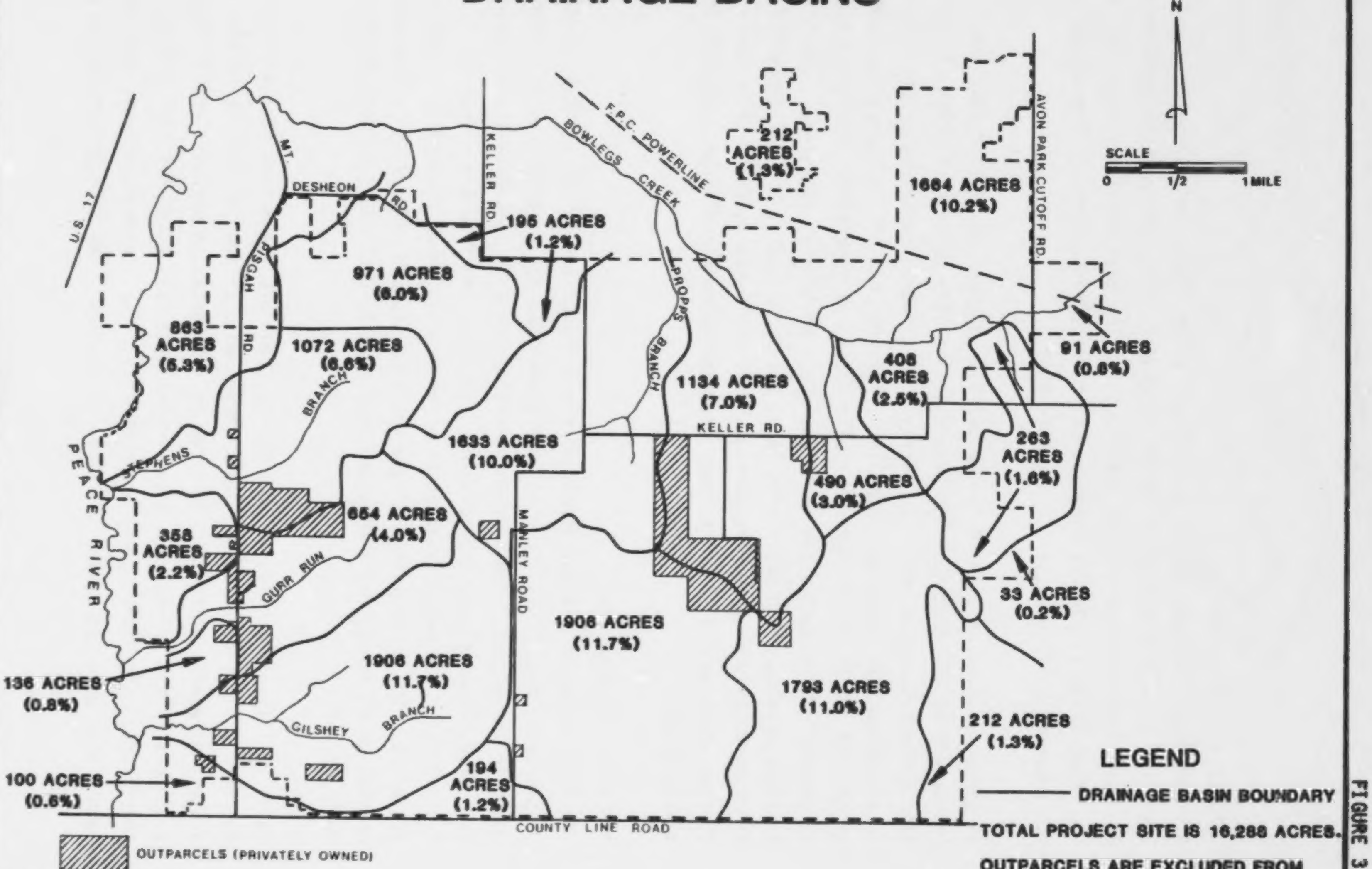
The project site extends along 4.5 miles of the east bank of the Peace River, directly north of the Polk-Hardee County line. Bowlegs Creek, a major tributary of the Peace River, flows through the northeast section of the proposed mine site and enters the Peace River north of the site. Seven small on-site tributaries contribute to Bowlegs Creek's flow while three small tributaries, Stephens Branch, Gurr Run, and Gilshey Branch, flow directly into the Peace River from the project site. These tributaries and their associated drainage basins are illustrated in Figure 3.5-B. The Bowlegs Creek drainage basin, totalling 59 square miles, includes 7,061 acres or 43 percent of the project site. Land in this basin is primarily pasture and woodlands; the less dominant land uses are citrus production and phosphate mining. There are no significant population centers or point source discharges in the Bowlegs Creek drainage basin. The three tributaries that flow into the Peace River comprise a combined drainage area of 5,089 acres or 31 percent of the project site. Two other sub-basins, which include 4,138 acres or 26 percent of the project site, drain to the south. These are part of larger drainage systems which lie outside the project boundaries and eventually drain to the Peace River from Little Charlie Creek.

3.5.1.3 Surface Water Characteristics

Water quantity and quality data were collected to determine baseline characteristics of surface water in the vicinity of the proposed mine site. Baseline water quantity data were established from water level and flow measurements collected between June, 1979 and March, 1980 and from additional information obtained from state and Federal agencies. Water quality data were collected from April, 1979 to December, 1979; supplemental data from state and Federal sources were also used.

FIGURE 3.5-8

DRAINAGE BASINS


N
SCALE
0
1/2
1 MILE
U.S. 17
MT. PISGAH RD.
DESHEON RD.
KELLER RD.
F.P.C. POWERLINE
BOWLEGS CREEK
PROPPS BRANCH
AVON PARK CUTOFF RD.
MANLEY ROAD
COUNTY LINE ROAD
PEACE RIVER
STEPHENS
GURR RUN
GILSHEY BRANCH
BRANCH
212 ACRES (1.3%)
1664 ACRES (10.2%)
195 ACRES (1.2%)
971 ACRES (6.0%)
863 ACRES (5.3%)
1072 ACRES (6.6%)
1134 ACRES (7.0%)
408 ACRES (2.5%)
91 ACRES (0.6%)
263 ACRES (1.6%)
1633 ACRES (10.0%)
490 ACRES (3.0%)
654 ACRES (4.0%)
358 ACRES (2.2%)
33 ACRES (0.2%)
1906 ACRES (11.7%)
1906 ACRES (11.7%)
1793 ACRES (11.0%)
136 ACRES (0.8%)
212 ACRES (1.3%)
194 ACRES (1.2%)
100 ACRES (0.6%)
LEGEND
DRAINAGE BASIN BOUNDARY
OUTPARCELS (PRIVATELY OWNED)

TOTAL PROJECT SITE IS 16,288 ACRES.

OUTPARCELS ARE EXCLUDED FROM ACREAGE FIGURES.

SOURCE: STUDY DATA

3.5.1.3.1 Peace River

Average monthly flows, annual mean flows, flood flows, and seven-day, ten-year low flows for the Peace River at the northwest corner of the site upstream of Bowlegs Creek are presented in Table 3.5-1. The mean annual average flow for the Peace River is 134 cfs upstream of the site (above Bowlegs Creek) and 185 cfs downstream of the site (County Line Road).

In general, water quality in the Peace River appears to be poor near the headwaters of the river but improves substantially downstream (FDER, 1980). Data collected during the field survey (Table 3.5-2) reveal concentrations of total phosphorus, fluoride, iron, lead, mercury, and oil and grease exceeding either Federal or state criteria (Table 3.5-3) at some time. Dissolved oxygen concentrations dropped below criteria levels on several occasions. The high nutrient levels, potentially high fecal coliform levels, and low concentrations of dissolved oxygen are attributed to the existing point source discharges upstream and nonpoint source loadings from mined areas, pastures and citrus groves.

3.5.1.3.2 Bowlegs Creek

The flow rates for Bowlegs Creek correlate directly with the rainfall patterns of the area; high flows occur in late summer and early autumn and low flows occur in the spring. The calculated average monthly long-term flows, annual mean flow, flood flows, and seven-day, ten-year low flow are presented in Table 3.5-1. The annual average flow for Bowlegs Creek downstream of the site is 46 cfs. The contribution of Bowlegs Creek to the Peace River's flow was 26 percent on an annual basis with the mean monthly contribution never exceeding 40.5 percent.

Water quality data collected for Bowlegs Creek are summarized in Table 3.5-4. The stream's dissolved oxygen levels have, on occasion, dropped below the state and Federal criteria. This can be attributed to nonpoint runoff from pastures, citrus groves, and areas remaining barren after previous mining operations. High total phosphorus, mercury, lead, cadmium, nickel, and zinc levels also occurred during the sampling program. The high phosphorus levels

TABLE 3.5-1

AVERAGE MONTHLY FLOWS FOR THE PEACE RIVER AND BOWLEGS CREEK (cfs)

Month	Peace River(a)	Bowlegs Creek	
		Upstream	Downstream
January	74	16	19
February	82	15	19
March	108	26	32
April	28	8	9
May	86	10	12
June	132	43	52
July	219	69	83
August	224	70	85
October	139	111	134
November	76	68	82
December	85	14	16
Annual Mean Flow	134	38	46
7-Day, 10-Year, Low Flow	11	0	0
25-Year Flood Flow	5,871	2,880(b)	
100-Year Flood Flow	8,554	4,600(b)	

(a) Flows were calculated by increasing Fort Meade flows by 1 percent. Values represent Peace River flow immediately upstream of Bowlegs Creek.

(b) Flood flows were calculated for the creek section between upstream and downstream monitoring station.

SOURCE: STUDY DATA AND USGS

TABLE 3.5-2

WATER QUALITY DATA SUMMARIES FOR PEACE RIVER STATIONS WQ-7 AND FDER DATA COLLECTED AT COUNTY LINE ROAD

Parameter	WQ-7					FDER DATA (Station #25020008)				
	Max	Min	Avg	N	FE	Max	Min	Avg	N	FE
Water Level (ft)	5.72	2.79	4.20	3	-	-	-	-	-	-
Flow (cfs)	-	-	-	-	-	-	-	-	-	-
pH (units)	7.7	6.6	-	5	0	7.3	6.5	-	9	0
Carbon Alkalinity (mg/l $CaCO_3$)	0	0	0	5	-	-	-	-	-	-
Bicarbonate Alkalinity (mg/l $CaCo_3$)	52	21	42	5	0	-	-	-	-	-
Temperature (°C)	28	15	23.8	5	-	-	-	-	-	-
Dissolved Oxygen (mg/l)	8.4	3.3	4.93	4	3	8.1	3.4	5.45	8	4
Total Suspended Solids (mg/l)	40	10	28.2	5	-	-	-	-	-	-
Turbidity (NTU)	15.0	1.7	8.67	3	0	14.5	5.3	9.2	9	0
Total Dissolved Solids (mg/l)	174	142	162.7	3	-	-	-	-	-	-
Conductivity (umho/cm)	400	198	309.6	5	0	400	175	271.7	9	0
Total Hardness (mg/l $CaCO_3$)	224	96	141.7	3	-	-	-	-	-	-
BOD_5 (mg/l)	6.3	0.2	3.3	5	-	-	-	-	-	-
Orthophosphate (mg/l)	5.27	0.56	2.41	5	-	-	-	-	-	-
Total Phosphorus (mg/l)	5.28	0.58	2.51	5	5	9.77	0.85	3.57	9	9
Ammonia (mg/l)	0.61	0.17	0.33	5	-	-	-	-	-	-
Organic-N (mg/l)	2.5	0.5	1.76	5	-	-	-	-	-	-
Nitrate - N (mg/l)	1.8	0.4	1.0	5	0	1.414	-	-	-	-
Nitrite - N (mg/l)	0.07	0.02	0.04	5	-	-	-	-	-	-
Total Nitrogen (mg/l)	3.88	1.73	3.13	5	-	-	-	-		-
Chloride (mg/l)	29.8	14.7	19.6	5	-	20.4	12.0	16.5	9	-
Fluoride (mg/l)	2.4	0.77	1.39	5	2	2.23	1.35	1.73	3	2
Sulfate (mg/l)	130.2	28.7	56.0	5	2	169	32.2	85.3	3	-
Sulfide (mg/l)	1.40	0.3	0.7	3	-	-	-	-	-	-
Barium (mg/l)	<0.1	<0.1	<0.1	1	0	-	-	-	-	-
Cadmium (mg/l)	0.04	<0.01	<0.02	3	0	-	-	-	-	-
Chromium (mg/l)	<0.06	<0.05	<0.05	3	0	-	-	-	-	-
Copper (mg/l)	<0.03	<0.03	<0.03	3	0	-	-	-	-	-
Iron (mg/l)	0.67	0.08	0.40	3	2	-	-	-	-	-
Lead (mg/l)	0.07	<0.03	<0.05	3	2	-	-	-	-	-
Mercury (mg/l)	0.0035	<0.002	<0.0014	3	2	-	-	-	-	-
Nickel (mg/l)	<0.06	<0.06	<0.06	3	0	-	-	-	-	-
Selenium (mg/l)	<0.025	<0.025	<0.025	3	0	-	-	-	-	-
Silver (mg/l)	<0.03	<0.03	<0.03	1	0	-	-	-		-
Silica (mg/l)	3.10	1.60	2.3	3	-	-	-	-	-	-
Zinc (mg/l)	.044	.024	.031	3	0	-	-	-	-	-
Pesticide Scan (mg/l)	ND	ND	ND	3	0	-	-	-	-	-
Herbicide Scan (mg/l)	ND	ND	ND	3	0	-	-	-	-	-
Detergent MBAS (mg/l)	0.20	0.05	0.13	3	-	-	-	-	-	-
Oil & Grease (mg/l)	8.1	0.1	4.1	2	1	-	-	-	-	-
Total Gross Activity (pCi/l)	2.7	<0.8	<1.8	4	0	0.9	<0.9	<0.9	2	0
Radium Alpha Activity (pCi)	0.9	<0.6	<0.8	2	0	-	-	-	-	-
TOC mg/l)	67.1	39.5	50.4	3	-	20	8	17.6	5	-

Max - Maximum value occurring during study program
Min - Minimum value occurring during study program
Avg - Arithmetic average of monthly data
N - Number of data points evaluated
FE - Frequency of Exceedance with applicable Federal and state water quality criteria
ND - Non-Detectable

SOURCE: STUDY DATA AND FDER DATA

TABLE 3.5-3

STATE OF FLORIDA AND FEDERAL WATER QUALITY CRITERIA

Parameter	F.A.C. 17-3 General Criteria	F.A.C. 17-3 Class III	EPA Water Quality Criteria
Alkalinity, Total as $CaCO_3$ (min.)	--	20	20
Alkalinity, Phenolpathalein	--	20	20
Aluminum	--	1.5	--
Ammonia (non-ionized)	--	0.02	0.02
Antimony	--	0.2	--
Arsenic	0.08	--	--
Bacteriological (Coliform, Total and Fecal)	--	1000/100ml. Tot. 200/100ml. Fec.	200/100ml. fecal
Barium	--	--	1.0
Beryllium	--	0.011	0.011 (Softwater) 1.100 (Hardwater)
BOD (5-day)	Note 1	--	--
Boron	--	--	0.750
Cadmium, µg/l	--	10	10 (Health) 12 (Aquatic life softwater)
Chlorine	--	0.010	0.010
Chromium (Total)	0.05	--	0.050
Color (PCU)	--	--	75 (Health)
Copper	0.5	0.030	1.0
Cyanide (Total), µg/l	--	5	5
Detergents MBAS	0.5	--	--
Dissolved Oxygen (min.)	--	5	5.0
Fluoride	10.0	Marine Only	--
Hydrogen Sulfide	--	--	0.002
Iron	--	1.0	0.30
Lead	0.05	0.03	0.05
Manganese	--	--	0.05
Mercury, µg/l	--	0.2	2 (Health) 0.5 (Freshwater life)
Nickel	--	0.1	0.1
Nitrogen, Nitrate - N	--	--	10
Oils and Grease	5.0	--	0 (Domestic water supply)
Pesticides/Herbicides Scan			
Aldrin - Dieldrin, µg/l	--	0.003	0.003
Chlordane, µg/l	--	0.01	0.01
2, 4 - D	--	--	0.10
2, 4, 5 TP µg/l	--	--	10
DDT, µg/l	--	0.001	0.001
Demeton, µg/l	--	0.1	0.1
Endosulfan, µg/l	--	0.003	0.003
Endrin, µg/l	--	0.004	0.2 (Health) 0.004 (Aquatic life)
Guthion, µg/l	--	0.01	0.01
Heptachlor, µg/l	--	0.001	1.0
Lindane, µg/l	--	0.1	4.0 (Health) 0.01 (Freshwater life)
Malathion, µg/l	--	0.1	0.1
Methoxychlor, µg/l	--	0.03	0.03
Mirex, µg/l	--	0.001	0.001
Parathion, µg/l	--	0.04	0.04
Toxaphene, µg/l	--	0.005	0.005
pH	6.0-8.5	6.0-8.5	6.5-9.0
Phenols	0.001	--	--
Phthalate Esters	--	0.003	0.003
Phosphate, Total as P	--	--	0.050
Polychlorinated biphenyls µg/l	--	0.001	0.001
Radioactivity			
Gross - activity pCi/l[2]	15	--	--
Radium - 226 pCi/l	5	--	--
Radium - 228 pCi/l	5	--	--
Selenium	--	0.025	0.01
Silver µg/l	--	0.07	50
Specific Conductance µmho/cm	100% increase 500 max.	--	--
Total Suspended Solids	--	--	Note 2
Turbidity, JTU	50	--	--
Zinc	1.0	--	5

Note: All Concentrations are in milligrams/liter unless otherwise noted.

[1] Sufficiently low to keep dissolved oxygen within limits.

[2] Ten percent maximum reduction in compensation depth from seasonal norm.

TABLE 3.5-4

WATER QUALITY DATA SUMMARIES FOR BOWLEGS CREEK - STATIONS WQ-1 AND WQ-2

Parameter	WQ-1 (upstream)					WQ-2 (downstream)				
	Max	Min	Avg	N	FE	Max	Min	Avg	N	FE
Water Level (ft)	4.42	0.70	1.73	8	-	4.68	1.99	2.98	7	-
Flow (cfs)	171.8	2.7	43.2	8	-	187	4.0	57.8	7	-
pH (units)	6.75	4.6	-	9	5	7.2	4.7	-	9	4
Carbon Alkalinity (mg/l) $CaCO_3$	0	0	0	9	-	0	0	0	9	-
Bicarbonate Alkalinity (mg/l) $CaCO_3$	8	1	3.8	7	7	10	0	4	9	9
Temperature (°C)	27.0	16.0	23.8	9	-	27	16	24.4	9	-
Dissolved Oxygen (mg/l)	9.35	3.9	6.56	8	2	10	4.3	6.75	8	2
Total Suspended Solids (mg/l)	14	1	6.7	9	-	27	1	8.3	9	-
Turbidity (NTU)	4.3	1.4	2.45	6	0	5.4	1.3	2.7	6	0
Total Dissolved Solids (mg/l)	152	38	110	6	-	154	88	117	6	-
Conductivity (umho/cm)	145	60	97	8	0	695	62	168	8	0
Total Hardness (mg/l) $CaCO_3$	52	20	32	6	-	48	20	31	6	-
BOD_5 (mg/l)	2.3	0.2	1.19	9	-	2.4	0.2	1.2	9	-
Orthophosphate (mg/l)	0.26	0.09	0.18	9	-	0.39	0.16	0.23	9	-
Total Phosphorus (mg/l)	0.38	0.12	0.22	9	9	0.88	0.18	0.34	9	9
Ammonia (mg/l)	0.60	0.07	0.24	9	-	0.7	<0.1	0.25	9	-
Organic-N (mg/l)	1.5	0.6	0.98	9	-	1.5	0.4	1	8	-
Nitrate-N (mg/l)	3.7	0.2	1.7	9	0	3.4	0.4	1.5	9	0
Nitrite-N (mg/l)	0.03	<0.01	<0.01	9	-	0.03	<0.01	<0.01	9	-
Total Nitrogen (mg/l)	4.93	1.49	2.94	9	-	4.53	1.53	2.71	9	-
Chloride (mg/l)	19.4	11.0	14.9	9	-	18.2	11.0	14.4	9	-
Fluoride (mg/l)	0.20	0.10	.15	9	0	0.20	0.12	0.1	9	0
Sulfate (mg/l)	20.6	2.4	12.2	9	-	17.5	3.0	12.5	9	-
Sulfide (mg/l)	1.2	0.1	0.7	6	-	1.3	0.1	0.72	6	-
Barium (mg/l)	<0.01	<0.01	-	3	0	<0.01	<0.01	<0.01	3	0
Cadmium (mg/l)	0.12	0.01	0.05	6	0	0.66	<0.01	<0.13	6	0
Chromium (mg/l)	0.07	<0.05	-	6	1	0.10	<0.05	<0.06	6	1
Copper	<0.03	<0.03	-	6	0	<0.03	<0.03	<0.03	6	0
Iron (mg/l)	0.74	0.12	0.44	6	5	0.73	0.10	0.47	6	5
Lead (mg/l)	0.04	<0.03	-	6	1	0.09	<0.03	<0.04	6	1
Mercury (mg/l)	0.0207	0.0008	0.0064	6	6	0.0188	<0.0002	0.0048	6	5
Nickel (mg/l)	20.9	<0.06	<3.5	6	1	<0.06	<0.06	<0.6	6	0
Selenium (mg/l)	0.037	<0.005	<0.024	6	1	0.044	<0.005	<0.028	6	2
Silver (mg/l)	<0.03	<0.03	<0.03	3	0	<0.03	<0.03	<0.03	3	0
Silica (mg/l)	7.8	0.9	4.1	6	-	7.9	0.8	3.7	6	-
Zinc (mg/l)	0.088	0.025	0.052	6	0	0.095	0.025	0.048	6	0
Pesticide Scan (mg/l)	ND	ND	ND	6	0	ND	ND	ND	6	0
Herbicide Scan (mg/l)	ND	ND	ND	6	0	ND	ND	ND	6	0
Detergent MBAS (mg/l)	0.20	0.04	0.13	6	-	0.19	0.10	.14	6	-
Oil & Grease (mg/l)	1.2	<0.01	0.38	4	0	0.5	<0.1	<0.2	4	0
Total Gross Alpha Activity (pCi)	5.0	1.1	2.7	8	0	3.4	<1.0	<0.2	8	0
Radium Alpha Activity (pCi)	5.7	<1.0	<2.5	5	1	2.6	<1.1	<1.8	2	0
TOC (mg/l)	71.4	29.1	48.5	6	-	64.4	32.0	46.4	6	-

Max - Maximum value occurring during study program
Min - Minimum value occurring during study program
Avg - Arithmetic average of monthly data
N - Number of data points evaluated
FE - Frequency of Exceedance with applicable Federal and state water quality criteria
ND - Non-Detectable

SOURCE: STUDY DATA

may be naturally occurring or may be attributed to nonpoint source runoff. Reasons for the high trace metal concentrations are not apparent.

3.5.1.3.3 On-site Tributaries

The proposed mine site contains several small drainage systems resulting from groundwater seepage and/or surface runoff. These small tributaries flow into the Peace River and Bowlegs Creek and typically have their headwaters in wetland depressions. They have highly variable flows, corresponding to runoff during seasonal rainfall and groundwater inflow. The estimated average monthly flows (adjusted for long-term trends and flood flows) and seven-day, ten-year low flows for each of the key tributaries are presented in Table 3.5-5. Annual flow contributions from the tributaries to their receiving systems are small. The Peace River flow is increased by less than 2.3 percent due to the on-site tributaries, and Bowlegs Creek's flow is increased by approximately 13 percent.

Water quality data (Table 3.5-6) appear to be highly variable for several key parameters including BOD_5, dissolved oxygen, total organic carbon, total nitrogen, and total suspended solids. Variability in these parameters is common for streams such as these having extreme flow fluctuations. The upper reaches of the tributaries exhibit high levels of nitrogen which can be attributed to surface runoff from pasture areas. The high fluoride concentrations in the lower stream sections may be due to increased groundwater seepage. Conductivity and color patterns in the lower sections indicate a shift in influence from surface water or Surficial Aquifer to a deeper groundwater system.

3.5.1.4 Surface Water Utilization

EPA (1978) reported an absence of existing surface water withdrawal sites in the Polk County portion of the Peace River basin. There are no significant domestic or industrial water withdrawals, although some unpermitted withdrawals for agricultural and other uses may exist.

TABLE 3.5-5

AVERAGE MONTHLY FLOWS
CALCULATED FOR SELECTED ON-SITE TRIBUTARIES
(cfs)

	Maron Run WL- 3	Stephens Branch WL- 4	Gilshey Branch WL- 5	West Trib to Parker WL- 6	East Trib to Parker WL- 9	Gurr Run WL- 10	Cypress Area WL- 11
January	0.5	0.4	1.0	1.1	1.0	0.4	0.3
February	0.5	0.4	0.9	1.1	1.0	0.4	0.3
March	0.9	0.7	1.6	1.8	1.6	0.6	0.6
April	0.3	0.2	0.5	0.5	0.5	0.2	0.2
May	0.3	0.3	0.6	0.7	0.6	0.2	0.2
June	1.4	1.2	2.6	2.9	2.7	1.0	0.9
July	2.3	1.9	4.1	4.7	4.3	1.6	1.5
August	2.3	1.9	4.2	4.8	4.4	1.6	1.5
September	3.7	3.0	6.7	7.6	6.9	2.6	2.3
October	2.2	2.2	4.1	4.6	4.2	1.6	1.4
November	0.5	0.4	0.8	0.9	0.8	0.3	0.3
December	0.3	0.3	0.6	0.6	0.6	0.2	0.2
Annual Mean Flow	1.3	1.1	2.3	2.6	2.4	0.9	0.2
7-Day 10-Year Low Flow	0	0	0	0	0	0	0
25-Year Flood Flow	310	922	1626	-	-	870	-
100-Year Flood Flow	400	1216	2135	-	-	1140	-

- No Data Available

SOURCE: STUDY DATA

TABLE 3.5-6

MEAN WATER QUALITY OF ON-SITE TRIBUTARIES

PARAMETER	GILSHEY BRANCH	GURR RUN	STEPHENS BRANCH	MARON RUN	WEST TRIBUTARY TO PARKER BRANCH	EAST TRIBUTARY TO PARKER BRANCH
Water Level (ft)	1.06	-	0.39	1.07	7.52	0.68
Flow (cfs)	0.68	-	0.34	0.17	-	-
pH (units)	-	-	-	-	-	6.1
Carbonate Alkalinity (mg/1 $CaCO_3$)	0	0	0	0	0	0
Bicarbonate Alkalinity (mg/1 $CaCO_3$)	23.3	24.6	7.9	30.4	7.5	13
Temperature (^{o}C)	23.3	21	22.2	22.7	26.9	25.1
Dissolved Oxygen (mg/1)	6.33	4.7	6.23	4.6	3.6	1.7
Total Suspended Solids (mg/1)	8.8	41	8.6	8.6	8.5	5.5
Turbidity (NTU)	2.6	11.3	3.8	1.36	1.5	2.2
Total Dissolved Solids (mg/1)	163.4	190	126.8	145	177	150
Conductivity (µ mho/cm)	155	138.7	101.3	116.8	85.8	155
Total Hardness (mg/1 $CaCO_3$)	53	-	37	51	29.6	20
BOD_5 (mg/1)	1.1	1.5	1.7	0.98	1.98	2.0
Orthophosphate (mg/1)	1.17	1.59	0.83	0.72	0.42	0.60
Total Phosphorus (mg/1)	1.28	1.82	0.94	0.74	0.5	0.72
Ammonia (mg/1)	0.27	0.23	<0.21	<0.16	<0.21	0.26
Organic-N (mg/1)	0.69	1.3	0.82	0.62	1.18	1.2
Nitrate-N (mg/1)	0.45	0.77	1.16	0,16	0.28	0.45
Nitrite-N (mg/1)	<0.01	0.02	<0.01	<0.01	<0.01	0.02
Total Nitrogen (mg/1)	1.36	2.31	2.19	0.90	1.67	1.92
Chloride (mg/1)	22.3	25.0	17.3	11.7	16.6	15.0
Fluoride (mg/1)	0.46	0.46	0.37	0.36	0.21	0.17
Sulfate (mg/1)	21.9	15.4	8.8	7.9	13.3	44.1
Sulfide (mg/1)	0.6	-	0.67	0.65	0.82	1.2
Barium (mg/1)	<0.1	-	<0.01	<0.1	<0.1	-
Cadmium (mg/1)	<0.03	-	<0.02	<0.07	<0.02	0.03
Chromium (mg/1)	<0.07	-	<0.07	<0.06	<0.07	.15
Copper (mg/1)	<0.03	-	<0.03	<0.03	<0.03	<0.03
Iron (mg/1)	0.77	-	0.44	0.50	0.6	0.57
Lead (mg/1)	<0.04	-	<0.05	<0.04	<0.05	0.08
Mercury (mg/1)	0.0053	-	0.0025	<0.0044	0.0034	0.0039
Nickel (mg/1)	<0.06	-	<0.06	<0.07	<0.06	<0.06
Selenium (mg/1)	<0.029	-	<0.032	<0.022	<0.022	<0.025
Silver (mg/1)	<0.03	-	<0.03	<0.03	<0.03	-
Silica (mg/1)	4.74	-	4.18	6.3	2.18	4.4
Zinc (mg/1)	0.048	-	0.042	0.056	.035	0.26
Pesticide Scan (mg/1)	ND	-	ND	ND	ND	ND
Herbicide Scan (mg/1)	ND	-	ND	ND	ND	ND
Detergent MBAS (mg/1)	.12	-	0.16	0.16	0.23	0,00
Oil & Grease (mg/1)	<1.0	-	2.8	<0.7	<3.7	-
Total Gross Alpha Activity (pCi/1)	<1.2	3.4	<1.6	<1.0	<1.4	1.0
Radium Alpha Activity (pCi/1)	1.2	2.2	2.4	<1.0	<1.0	-
TOC (mg/1)	47.3	39.9	32.6	47.2	62.5	57.9

ND - Not Detected

SOURCE: STUDY DATA

The Central Florida Areawide Water Quality Management Plan (208 Study) identifies two categories of wastewater dischargers to the Peace River Basin, i.e., domestic and industrial. Twenty-eight domestic dischargers with a total design capacity of 31.39 mgd and 38 industrial dischargers with a total design capacity of 927.61 mgd were identified upstream of the proposed mine site (CFRPC, 1978).

3.5.2 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

3.5.2.1 The No Action Alternative

With the no action alternative no changes in the quantity of surface water are expected in the area of the proposed mine. Seasonal changes in water level and flow would continue without disruption, and the hydrologic characteristics of the streams and rate of baseflow to them would remain the same.

Surface water quality with the no action alternative would be determined by future land uses both on site and in the surrounding area. If land use patterns remain as today, surface water quality might remain much as it is. If other phosphate mines are constructed in the area, then surface water quality of select streams may show increases in parameters such as specific conductance, total dissolved solids, sulfate, and fluoride.

3.5.2.2 The Action Alternatives Including the Proposed Action

3.5.2.2.1 Mining Method Alternatives

Dragline (Mobil's Proposed Action): Dragline operations would require vegetation clearing on 50-acre tracts in front of each dragline. This would result in a small increase in surface water runoff flow and an increase in the sediment contained in the runoff as a result of erosion. The amount of cleared land should not exceed 100 acres at any one time, resulting in a minimal effect on surface water.

During the mining process, land would be mined and then later converted to waste disposal areas. This surface distruption would destroy the existing onsite tributaries of the Peace River and Bowlegs Creek. (Reclamation of drainage basins and streams is discussed under Section 3.5.2.2.5, Reclamation

Alternatives). Precipitation occurring on these disturbed areas would be collected in the mine pits and disposal areas and directed to the recirculation system until reclamation is completed, reducing the amount of runoff from the site and thereby decreasing stream flows. The amount of disturbed land would vary during the mine life with the maximum area disturbed occurring in year 20 when approximately half the site would be in use for mining and waste disposal (Figure 3.5-C). During this time, the reduction in flow to the Peace River would be 8.5 cfs or 4.6 percent of the flow in the Peace River directly below the site (discounting any discharge flow from the plant water system). The maximum average flow reduction to Bowlegs Creek would be approximately 8 cfs or 17.4 percent of the flow in Bowlegs Creek as it leaves the property. These flow reductions would be temporary with flows returning to normal at the completion of mining and reclamation activities.

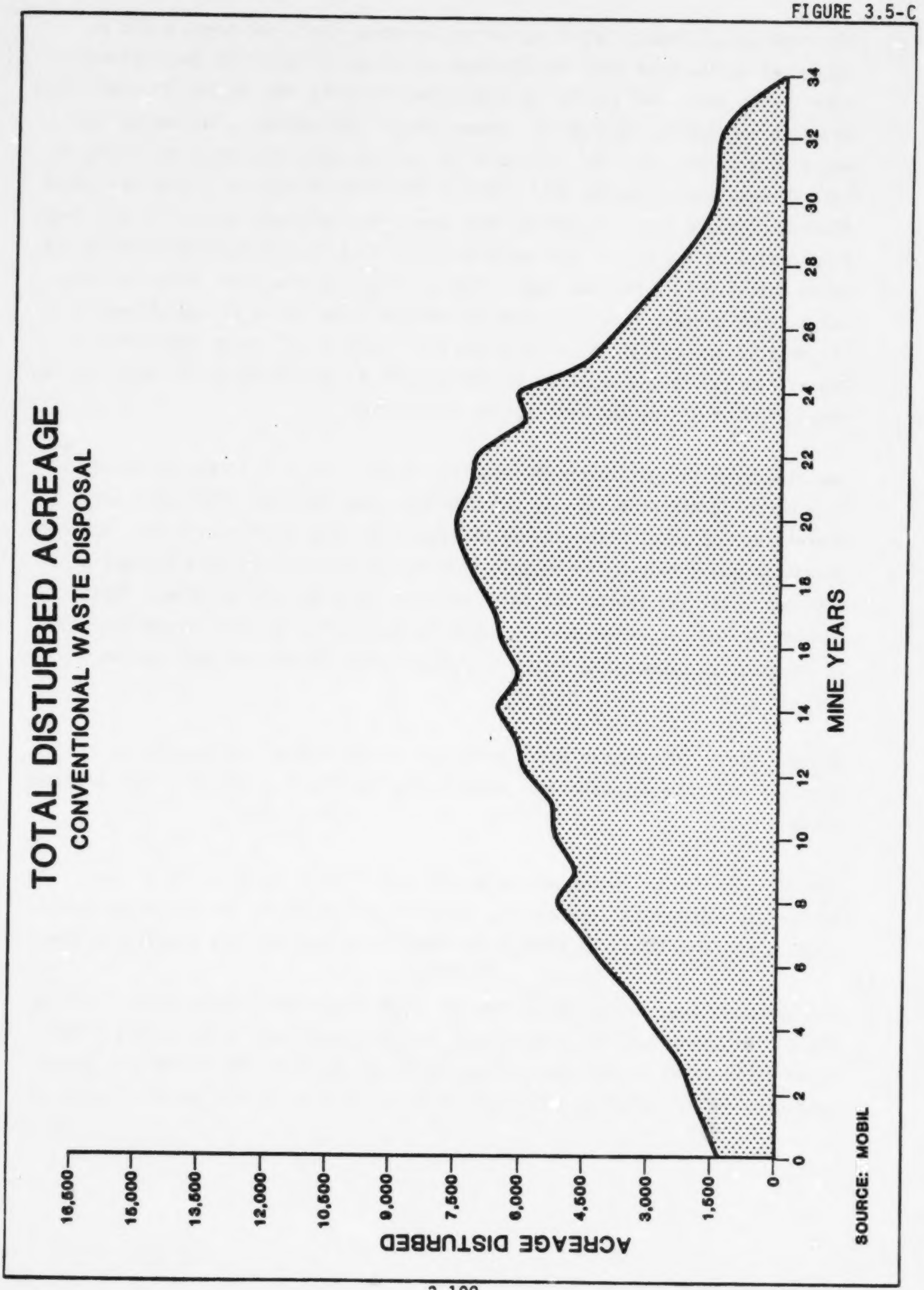
The reduction in surface runoff and flow in on-site tributaries would result in a minor decrease in organic and nutrient mass loadings (BOD, TOC, total phosphorus and total nitrogen) to Bowlegs Creek and the Peace River. The flow reduction would reduce the organic load to the Peace River by 2 percent or less and total phosphorus and total nitrogen by 1 percent or less. These changes in surface water quality would be temporary, and the stream quality is expected to eventually return to normal after mining and reclamation activity ceases.

Bucket Wheel: The bucket wheel method of mining would have impacts on the site and the adjacent waterways essentially identical to those of the proposed action.

Dredge: The dredge mining method would also disrupt large areas of land during the mine life. The effects of this disruption on surface water quantity in the area would be similar to those described for the proposed action.

The dredge mining method would require large diked and flooded areas. During the mining operation, the water level in the dredge pool would maintain the water table level in the surrounding Surficial Aquifer and, therefore, maintain groundwater baseflow contribution to any stream in the immediate area of

FIGURE 3.5-C



TOTAL DISTURBED ACREAGE

CONVENTIONAL WASTE DISPOSAL

SOURCE: MOBIL

mining. The dredging operation would increase the concentration of total suspended solids, organic material, and inorganic material in the dredge pool water. Adverse water quality impacts could occur if turbid water from the dredge pond were released to surface waters.

3.5.2.2.2 Matrix Transfer Alternatives

Pipeline (Mobil's Proposed Action): Mining on the north side of Bowlegs Creek would require a matrix slurry pipeline stream crossing of Bowlegs Creek during a four year period of the mine life. If a break or leak occurred in the transfer line at the stream crossing, suspended solids, nutrients and sediment would be dramatically increased and smaller increases in Ra-226, specific conductance, and total dissolved solids would occur in Bowlegs Creek. The effects on water quality would be for a short time until corrective clean-up action were taken. The use of valves and double-walled pipe as described in Mobil's proposed action would minimize the potential for a spill occurrence at the stream crossing.

Conveyor Belt: The potential for spillage of matrix material at a stream crossing is also a possibility with the conveyor belt system. However, since the material would be in a solid rather than slurried condition, the resulting effects of a spill would be expected to be less than for the proposed action.

Truck: A spill resulting from matrix transfer by truck is possible but least probable of the three alternatives. Should a spill occur it would amount to a small volume of material in solid form. The resulting effects of a spill should be minimal.

3.5.2.2.3 Matrix Processing Alternatives

Conventional Beneficiation (Mobil's Proposed Action): Several reagents would be utilized during the feed preparation and flotation processes: sodium hydroxide, fatty acid, fuel oil, sulfuric acid, amines and kerosene. The majority of the reagents would react during the beneficiation process to form sulfate compounds and would be discharged from the process in the waste sand tailings and clays. The reagents used and the dilution ratio in the wastewater if the reagents passed through the flotation process without chemically reacting would be as follows:

Reagent	Dosage, gal/day	Dilution
No. 5 Fuel Oil	4,230	13,200:1
Fatty Acid	2,680	20,900:1
Sulfuric Acid	3,040	18,400:1
Amine	530	105,700:1
Kerosene	450	124,400:1
Caustic	190	294,700:1

Water from the sand tailings disposal areas would be introduced into the recirculation system where the reagent compounds would again be mixed with the waste clays. The natural affinity of the reagents for phosphatic clay would result in their adherence to the clay particles, leaving only trace amounts of reagents in solution. The discharge from the clear water pool would contain low concentrations of the reagents and reagent-sulfate compounds.

Waste sand and clay would be pumped in slurry form from the beneficiation plant to waste settling areas. Should a leak develop in a transfer line, flooding and potential surface water contamination could result. The only stream crossing would be a sand tailings line crossing Bowlegs Creek occurring in years 21 and 22 of the mine life. The crossing would be located in the same area as the dragline crossing. Should a break occur at the crossing, flow and sedimentation would increase in Bowlegs Creek for a short time until corrective clean-up action were taken. There are no clay slurry lines crossing surface water streams on the site, and the shortest distance between a clay slurry line and any surface water stream (Bowlegs Creek or the Peace River) would be approximately 3,000 feet.

Dry Separation: Processing the matrix by dry separation would not require reagents, large quantities of water, or diked basins for water clarification. Dry separation would have minimal potential for affecting surface water quantity or quality.

3.5.2.2.4 Waste Disposal Alternatives

Conventional Clay Settling Case (Mobil's Proposed Action): A primary concern with above-grade settling basins is the potential for dike failure. In the event of a failure, large volumes of clay could be discharged into Bowlegs Creek and/or the Peace River increasing turbidity, destroying natural biological communities, depositing sediments, and raising the concentrations of sulfates, fluorides, and total dissolved solids.

During the life of the mine, approximately 8,170 acres of above-grade clay settling basins would be constructed with dike heights ranging from 25 to 45 feet and averaging 38.7 feet (Table 2.5-2). The worst case situation for a dike failure would be when the greatest amount of active above-grade settling acreage were in service. For the conventional clay settling case this occurs in mine years 12 through 14 when five basins (CS-4, CS-5, CS-6, CS-7 and CS-8) covering 2,790 acres are all active, operating in a flow through settling mode (Figure 2.5-B and Table 2.5-3). Should a dam failure happen at this time, it is estimated that 15,400 to 22,500 acre-feet of impounded clays could be released. Because of the natural topography of the site, most of the clays released would probably flow into Bowlegs Creek or the Peace River. It is doubtful that any off-site property would be affected except for the roadways that pass through the site. The primary effect would be to the on-site and downstream sections of the Peace River and Bowlegs Creek. Spills could also occur from other isolated clay settling areas. The primary effect would still be degradation of water quality in the Peace River or Bowlegs Creek.

The technology used to construct the settling basin dikes has improved substantially during the past decade, reducing the likelihood of a dike failure. Thorough investigations of foundation and soil conditions at the location of the proposed dikes would be conducted on the South Fort Meade site prior to design and construction. The dikes would be continuously inspected and monitored during the active life of the settling basins. Mobil would comply with the regulations for design, construction and maintenance of earthen dams established by the Florida Department of Environmental Regulation (FAC Chapter 17-9).

Sand/Clay Cap Case: The sand/clay cap waste disposal case has dike configurations similar to that of the conventional clay settling case; however, the average dike height is decreased two feet (Figure 2.5-C, Table 2.5-5). Flow through settling would not be practiced with this waste disposal case, therefore, the amount of above-grade settling acreage active at any one time is reduced. Basin CS-3 would be used during the life of the mine as a dredge basin and would be filled and emptied several times during the mining activities. The greatest amount of active above-grade settling occurs in mine years 17 through 19 when CS-3 and CS-10, with a maximum area of 1,860 acres, are active (Table 2.5-6). Should a dam failure occur at this time it is estimated that 25,500 to 33,600 acre-feet of impounded clays could be released.

The potential for a dike failure occurring is decreased for the sand/clay cap waste disposal case compared to the proposed action because of the reduced active settling acreage (less than 1,860 acres compared to 2,760 acres). The effect of a dam failure would be the same as that described for the proposed action except that total quantity of clay that could potentially spill would be reduced by 21 percent for the sand/clay waste disposal case compared to the conventional clay settling case. This reduction results from the lower average clay fill height with the sand/clay cap case (27 feet versus 34 feet).

Sand/Clay Mix Case: The sand/clay mix waste disposal case has 4,827 acres of above-grade clay settling basins with dike heights from 40 to 48 feet, and 3,352 acres of above-grade sand/clay mix basins with dike heights from 20 to 37 feet (Tables 2.5-8 and 2.5-10). The 4,827 acres of above-grade clay settling basins would be operated in a manner comparable to the sand/clay cap case and could not utilize flow through settling since these areas will be dewatered quickly in order to cap them with sand/clay mix. Two dredge basins would be constructed to provide clay for sand/clay cap material as well as sand/clay mix for the 3,352 acres of mix basins. The maximun amount of active settling acreage (2,450 acres) is between that of the conventional clay settling case (2,760 acres) and the sand/clay cap case (1,860 acres). Therefore, the potential for a dike failure occurring is greater than the sand/clay cap case but less than the conventional clay settling case.

The sand/clay mix case has two types of above-grade basins: sand/clay mix and conventional clay settling. The sand/clay mix material would consolidate more rapidly and would have a higher density than the clay wastes impounded separately. This increase in density and consolidation would result in a decrease in flow characteristics of the mix material should a dike failure occur from one of the mix basins. Therefore, the quantity of a sand/clay mix spill would be less than that expected from a clay settling basin spill. If a dike failure occurred from one of the clay settling basins the effect would depend on the quantity of material released but would be similar to that described under the conventional clay settling case.

Overburden Mix Case: The configuration, size and active settling acreage of above-grade basins with the overburden mix waste disposal case are similar to the sand/clay mix case; however, the extent of sand/clay mix impoundments would be increased to 5,492 acres. The average dam height would be 38 feet. The potential for a dike failure and resultant effect on surface water streams would be comparable to those described for the sand/clay mix basins under the sand/clay mix case.

3.5.2.2.5 Reclamation Alternatives

Conventional Clay Settling Plan (Mobil's Proposed Action): The Peace River and Bowlegs Creek would not be directly disturbed by the mining operation but would be influenced by alterations to the site's drainage patterns. The on-site tributaries and drainage areas disturbed by mining would be reconstructed as close to the premining conditions as the reclaimed topography would allow (Figure 2.6-A). A comparison of existing and post reclamation drainage areas within the major drainage systems found on the South Fort Meade site is summarized in Table 3.5-7.

The Peace River would receive five percent less direct surface drainage from the site. Bowlegs Creek's drainage area from the site would be reduced by six percent after reclamation. The Parker Branch drainage basin in the southern part of the site would be enlarged by approximately 17 percent. These variations are not substantial alterations to the overall drainage patterns of the

TABLE 3.5-7

COMPARISON OF EXISTING AND POST RECLAMATION DRAINAGE AREAS
(Conventional Plan)

Waterways Receiving Flow from On-Site Tributaries	Existing Tributary		Post Reclamation	
	Drainage Area (acres)	Average Flow (cfs)	Drainage Area (acres)	Average Flow (cfs)
Peace River	5,089	4.3	4,817	4.1
Bowlegs Creek	7,061	1.5	6,642	1.4
Drainage to South Parker Branch	4,138	0	4,829	0
Total	16,288	5.8	16,288	5.5

SOURCE: STUDY DATA

site and since all the surface water eventually flows into the Peace River, the total Peace River drainage basin and river flow would not be changed.

Approximately 60,000 linear feet of stream channels disturbed by mining would be restored during reclamation. Reclaimed stream channels would be developed in tailings fill with overburden cap or in overburden fill areas. These soil compositions are the most suitable for establishing stable channels because they are less susceptible to erosion and subsidence and can be successfully reforested with native wetland species. The proposed plans provide for the creation of a water level and an associated floodplain, similar to premining conditions, which would allow effective conveyance of flood flows. Shallow pools would be constructed at intervals of approximately 500 feet along the length of the new channels. Above-grade reclaimed waste disposal areas would drain to small marsh areas between 5 and 40 acres in size. These small marshes would be connected by overflow swales to a reconstructed stream channel.

Some minor alterations of surface runoff quantities and peak flows would be observed after reclamation. The increased clay content of the reclaimed soils in the 8,170 acres of clay settling areas would increase and, therefore, increase the total runoff quantities and peak flows expected following a rainfall. The marsh areas at the discharge location of the basins and shallow pools in the stream channels would provide some storage capacity and water rention which would minimize the increases in peak flows. The runoff quantities and peak flows from the sand tailings fill areas (5,034 acres) would be similar to the premining conditions.

After reclamation, stream water quality would be influenced primarily by pollutants carried in the runoff. The site would be reclaimed for agricultural and silvicultural uses. Small marsh areas established in the above-grade reclaimed areas and two large wetland areas (totaling 1,513 acres) would accumulate surface runoff from surrounding upland areas, trap sediment and filter excess nutrients. As the reclaimed streams mature, the channels will form natural meanders, and benthic communities will become re-established.

The water quality found within the established reclaimed streams would be similar to that presently found in the streams.

Sand/Clay Cap Plan: The surface water impacts resulting from the sand/clay cap reclamation plan would not vary greatly from the impacts discussed for the proposed action. Slight differences in the major drainage areas (Figure 2.6-F), as identified in Table 3.5-8, are associated with this case.

The total acreage of the above-grade clay settling areas would be the same as with the conventional plan; however, 93 percent of these areas would be capped with five feet of a 4:1 mixture of sand and clay and the remaining above-grade clay settling areas would be capped with one foot of overburden. Runoff quantities from these areas should not differ greatly from the premining conditions due to the similar permeability and infiltration and, therefore, similar runoff characteristics.

The total reclaimed and undisturbed wetland areas would be 2,057 acres which is seven percent greater than provided with the proposed action. Stream channel reclamation would be similar to that described for the proposed action except for the reclaimed channel of Propps Branch where excavation and rough grading would be done during final restoration when the surface sand/clay mix (4:1) had consolidated to 30 percent solids. Further subsidence of this basin and stream channel could create additional wetland areas along reclaimed Propps Branch. Water quality should not differ substantially from the conventional case due to the similar post-reclamation land use anticipated. However, less fertilizer would be required for agricultural uses with the sand/clay cap plan than with the conventional case.

Sand/Clay Mix Plan: The sand/clay mix reclamation plan has surface water impacts different from that of the proposed action resulting from differences in the reclaimed drainage basin areas, wetland areas and the restoration of Propps Branch. The major drainage basin areas under this case (Figure 2.6-H) are identified in Table 3.5-9.

TABLE 3.5-8

COMPARISON OF EXISTING AND POST RECLAMATION DRAINAGE AREAS
(Sand/Clay Cap Plan)

Waterways Receiving Flow from on-site Tributaries	Existing Tributary		Post Reclamation	
	Drainage Area (acres)	Average Flow (cfs)	Drainage Area (acres)	Average Flow (cfs)
Peace River	5,089	4.5	4,817	4.1
Bowlegs Creek	7,061	1.5	6,762	1.4
Drainage to South Parker Branch	4,138	0	4,709	0
TOTAL	16,288	5.8	16,288	5.5

SOURCE: STUDY DATA

TABLE 3.5-9

COMPARISON OF EXISTING AND POST RECLAMATION DRAINAGE AREAS
(Sand/Clay Mix Plan)

Waterways Receiving Flow from On-Site Tributaries	Existing Tributary		Post Reclamation	
	Drainage Area (acres)	Average Flow (cfs)	Drainage Area (acres)	Average Flow (cfs)
Peace River	5,089	4.3	5,306	4.4
Bowlegs Creek	7,061	1.5	6,273	1.3
Drainage to South Parker Branch	4,138	0	4,709	0
Total	16,288	5.8	16,288	5.7

SOURCE: STUDY DATA

The sand/clay mix reclamation plan would provide 2,255 acres of wetlands, 343 acres more than the conventional reclamation plan. This would provide greater water storage, filtering of nutrients, and removal of sediment.

The reclaimed stream channels would have a slightly different configuration than with the proposed conventional reclamation plan. Reclaimed portions of Propps Branch would be developed in a sand/clay mix (2:1) settling area. Stream restoration could be difficult within this area due to the susceptibility of the sand/clay mix to soil erosion. Other stream restoration would be performed in overburden material with a high content of sand which does not erode as easily as clay or 2:1 sand/clay mix. The unstable conditions in this drainage basin could slightly increase the suspended solids loading to Bowlegs Creek.

The sand/clay mix plan calls for 3,737 acres of clay surface, 3,020 acres of overburden cap surface, and 7,237 acres of 2:1 sand/clay mixture surface. The primary land uses anticipated for these areas are agriculture and silviculture, both of which are currently practiced. Constituent runoff loadings, flow and other water quality parameters are not expected to be substantially different from those anticipated for the proposed action.

Overburden Mix Plan: This reclamation plan would have similar drainage areas and employ similar restoration techniques to those discussed for the sand/clay mix plan. The primary change for this plan would be a greater surface area with 2:1 sand/clay mixture surface. The overburden mix plan has 8,339 acres of sand/clay mix surface while the sand/clay mix plan has 6,697 acres. This should increase the surface permeability and reduce runoff flow quantities from these areas. Wetland areas and stream restoration would be similar to that of the sand/clay mix plan.

3.5.2.2.6 Water Source Alternatives

Groundwater (Mobil's Proposed Action): The major quantity of process makeup water would be obtained from the Lower Floridan Aquifer. The impacts to surface water systems would therefore be minimal.

Surface Water: The use of surface water as the primary source of process water could be accomplished by impounding Bowlegs Creek. If Bowlegs Creek were impounded, the effect would be a severe flow reduction downstream of the impoundment as well as a disturbance of the natural floodplains and wetlands directly above and below the impoundment. Downstream flow reductions would reduce the Peace River's flow by approximately 26 percent and would deprive the river of natural nutrient and organic loads it presently receives from Bowlegs Creek. A problem associated with using surface water as the primary supply for processing is the need for additional water treatment.

3.5.2.2.7 Water Discharge Alternatives

Peace River (Mobil's Proposed Action): The primary discharge from the mining area would occur from the 45-acre clear water pool adjacent to the processing facility. Under the proposed plant siting, the clear water discharge would flow into the Peace River by way of a vegetated drainage swale (outfall ditch) constructed along the railroad spur route. The mine would have an intermittent discharge from the clear water pool primarily between the months of May through October, the months with increased rainfall. The discharged volume would be directly dependent on the local rainfall. The months when discharge is expected to be the greatest are June through September, a period when tropical storms are frequent in Florida.

The main areas of concern for water quality include pH, total suspended solids (TSS), total phosphorus and fluoride. The NPDES discharge data for Mobil's existing Fort Meade Mine indicate no significant fluctuations in pH (values range between 6.8 and 8.1 for the year). The discharge at the proposed mine would have a similar pH range and should not degrade the water quality of the receiving stream. Characteristic mass loadings (Table 3.5-10) were developed for the proposed South Fort Meade Mine discharge based on the constituent concentrations for the existing Fort Meade Mine discharge as well as other phosphate mines in the area. The mass loadings were developed for a wet season discharge of 9 mgd and a maximum discharge of 20 mgd, representing the 25-year storm event.

TABLE 3.5-10

IMPACT OF CLEAR WATER POOL DISCHARGE ON THE PEACE RIVER

Parameter	BASELINE CONDITIONS Concentration (mg/l)	BASELINE CONDITIONS Mass Loading (kg/day)	MINING CONDITIONS Concentration (mg/l)	MINING CONDITIONS Mass Loading (kg/day)
	(Peace River at Station WQ-7) Upstream		(Peace River at Station WQ-7) Upstream	
Suspended Solids	30	19,747	30	19,747
Total Phosphorus	1.9	1,251	1.9	1,251
Fluoride	1.1	724	1.1	724
	(Existing Mass Loading From Project Site)		(Estimate of Mine Effluent)	
Suspended Solids	--	45.3	25	853
Total Phosphorus	--	3.9	3	102
Fluoride	--	1.3	2	68
	(Existing Conditions Downstream of Project Site)		(Mine Effluent Mixed In Peace River)	
Suspended Solids	30	19,792	30	20,600
Total Phosphorus	1.9	1,255	2.0	1,353
Fluoride	1.1	725	1.2	792

Calculations are based on the following assumptions:

- Mean Peace River flow rate at the Fort Meade Station between June through September is considered to be 172 MGD.
- Mean constitutent concentrations found in the Peace River at Station WQ-7 (Peace River below Bowlegs Creek confluence) for the months of June through September are: suspended solids 30 mg/l, total phosphorus 1.9 mg/l and fluoride 1.1 mg/l. These values were derived from baseline data collected in the months of June and August 1979.
- Constituent concentrations and flows for all three tributaries flowing directly to the Peace River are similar to those derived for Gilshey Branch (constituent mass load for Gilshey Branch x 3), and that the five major on-site tributaries flowing to Bowlegs Creek are similar enough to those derived for Maron Run to represent the total contribution from the project site to the creek (constitutent mass load for Maron Run x 5).
- Mixing of the mine effluent with the river flow is complete, resulting in a homogeneous mixture .
- Average daily discharge from mine in year having normal rainfall is 9 MGD.
- Estimated mean flow from on-site tributaries between June and September 1979 is 0.77 MGD.

SOURCE: STUDY DATA

An evaluation of the present surface water characteristics and the projected characteristics during mining operations indicates that when the mine effluent is mixed with the Peace River's average flow between June and September, the concentrations of TSS, total phosphorus and fluoride are 30 mg/l, 2 mg/l and 1.2 mg/l, respectively (Table 3.5-10). These values are very similar to those naturally occurring from the mass loadings of the existing tributaries. The calculations are based on average river flow during a year with normal rainfall patterns. Average flow conditions are used instead of low flow conditions because discharge from the water system results from high rainfall events or periods when high river flows would be expected. The loading can be much greater or much less, depending on the rainfall trends. Discharge flows are based on normal flows derived during the mine year when the largest area will be included within the recirculation system. Before and after this peak year, less of the mine site will influence the waste discharge and more acreage within the site will contribute direct runoff to the streams.

There would be additional outfalls associated with the spillways of individual settling basins, but these would only discharge to Bowlegs Creek and Stephens Branch in extreme circumstances when excessive rainfall is anticipated to overtop the basins. Over the active mining period, the location of the emergency discharge outfalls would shift as basins are reclaimed. The quantities of constituents that might be released from an emergency spillway, while lowering the water levels in the basins to create capacity for a threatened excessive rainfall (a hurricane, for example), would depend on the total area of basins in use, and that area will change over the life of the mine operation. Table 3.5-11 presents the worst case existing concentration of water quality parameters of concern for the Peace River, Bowlegs Creek, Stephens Branch and the expected concentration of these same parameters in clay settling pond supernatant waters. The only Florida water quality standard (Table 3.5-3) that might be violated by discharge of clay settling pond supernatant was specific conductance. If this stream were discharged to Bowlegs Creek, the average discharge rate would have to be less than about 53 cfs (105 acre-feet/day) to avoid exceeding the allowable 100 percent increase in specific conductance. (This assumes a flow of 60 cfs in Bowlegs Creek, a typical flow during the summer

TABLE 3.5-11

COMPARISON OF THE SURFACE WATER QUALITY NEAR THE SOUTH FORT MEADE MINE SITE TO MEASURED VALUES IN CLAY SETTLING AREA DISCHARGES

Constituents[1]	Peace River[2]	Bowlegs Creek[3]	Stephens Branch	Clay Settling Area Supernatant[4]
pH, (units)	6.6-7.7	4.7-7.2	-	7.8
Specific Conductance, uhos/cm	310	168	101	523
Total Dissolved Solids	163	117	127	348
Calcium	-	-	-	57
Magnesium	-	-	-	22
Sodium	-	-	-	18
Potassium	-	-	-	1.3
Bicarbonate	42	4	7.9	112
Sulfate	56	12.5	8.8	144
Chloride	19.6	14.4	17.3	17
Iron	0.4	0.5	0.4	0.119
Silica	2.3	3.7	4.2	2.5
Fluoride	1.4	0.2	0.4	2.0
Nitrate, as N	1.0	1.5	1.2	1.06
Total Phosphorus	2.5	0.3	0.9	0.09
Radium-226, pCi/l	<0.8	<1.8	2.4	0.67

[1] Units are mg/l unless otherwise noted.

[2] Peace River WQ-7 Station (June, 1979-March, 1980)

[3] Bowlegs Creek WQ-2 Station (June, 1979-March, 1980)

[4] Lamont, et al. 1975. Characterization Studies of Florida Phosphate Slimes.

SOURCE: U.S. EPA, 1979. Development Document for Effluent Limitations Guidelines and Standards, Mineral Mining and Processing Industry, Point Source Category.

when excessive rain would be expected.) Discharge into Bowlegs Creek would increase the concentrations of specific conductance, total dissolved solids, bicarbonate, sulfate, chloride, and fluoride. Discharge into Stephens Branch would increase the concentration of specific conductance, total dissolved solids, bicarbonate, sulfate, and fluoride.

If the clay pond supernatant were discharged to the Peace River during the summer when the river flow typically might be 150 cfs, a discharge of about 1,230 cfs (2,430 acre-feet/day) would not raise the specific conductance of the river to the maximum of 500 umhos/cm (Table 3.5-3). Discharge into the Peace River would increase the concentrations of specific conductance, total dissolved solids, bicarbonate, sulfate, silica, and fluoride.

Bowlegs Creek: The discharge characteristics would be the same if the primary water discharge is directed to Bowlegs Creek instead of the Peace River. Because the flow in Bowlegs Creek is substantially less from that of the Peace River, the impact of the waste load would be greater. The mine discharge would increase the creek's average flow immediately downstream of the site from 24.6 mgd (38 cfs) to 33.6 mgd (52 cfs). This increase in flow could cause additional scouring of the stream channel which would alter the existing biological communities found in the creek. The additional flow would also increase the area affected by flooding during storms.

An evaluation of the effects of discharging to Bowlegs Creek indicates that concentrations of the three water quality parameters of concern would increase slightly with the introduction of the mine effluent. The TSS concentrations after mixing would increase from 10 mg/l to 14 mg/l, the total phosphorus concentration would increase from 0.24 mg/l to 0.98 mg/l, and the fluoride concentration would increase from 0.14 mg/l to 0.64 mg/l.

The effluent discharged to Bowlegs Creek would eventually flow into the Peace River. The impact on the river will be even less discernible than that previously discussed due to the additional dilution and mixing of the effluent prior to its entry into the river.

3.5.2.2.8 Product Transport Alternatives

Railroad (Mobil's Proposed Action): A concern associated with rail transport is the potential of a spill occurring at the Peace River crossing. If such an event should occur, phosphate rock would enter the stream, increasing suspended solids and sediment material and temporarily degrading the water quality of the river.

Truck: Truck transport of the phosphate rock would affect surface water in the same way as rail transport in the event of a spill. The size of a potential spill with a truck would be less than with rail transport.

3.6 BIOLOGY

3.6.1 THE AFFECTED ENVIRONMENT

3.6.1.1 Regional Setting

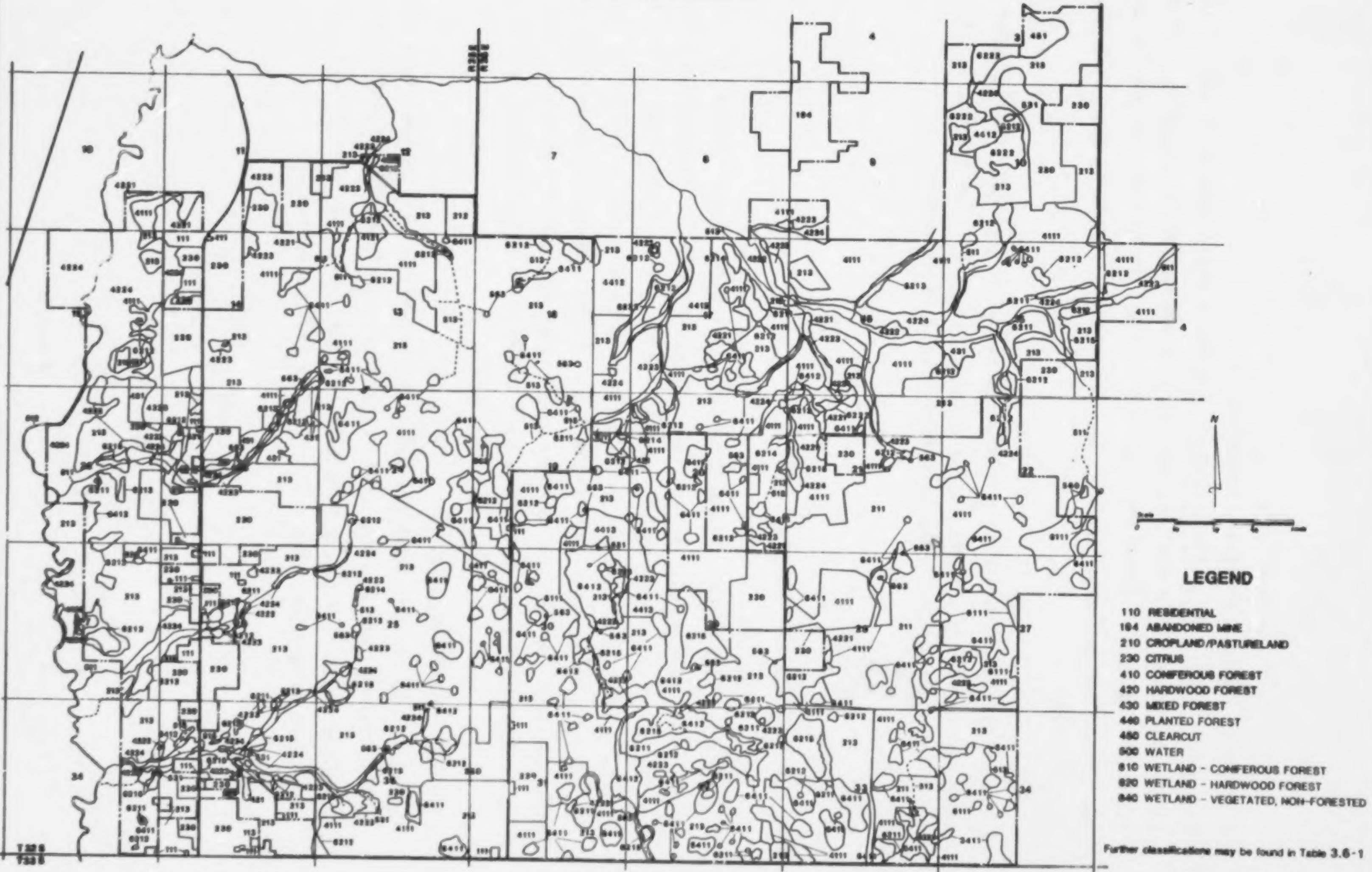
The proposed South Fort Meade Mine site is a part of the Central Florida Highlands biogeographic region, one of the seven major biogeographic regions of Florida. Over half of the annual precipitation of this region is received in the period June through September, which is the middle and latter part of the growing season for most vegetation. Faunal movement and habitat use patterns are also related to this cycling of wet and dry seasons. The region is a transition zone supporting both temperate and subtropical species.

3.6.1.2 Site Description

Based on the Florida Land Use and Cover Classification System (Kolb et al., 1976), thirty land use and cover classification types were identified on the proposed South Fort Meade Mine site (Figure 3.6-A and Table 3.6-1). The cover types may be grouped into the following four categories:

LAND USE AND COVER

BASED ON THE FLORIDA LAND
USE AND COVER CLASSIFICATION


LEGEND
110 RESIDENTIAL
184 ABANDONED MINE
210 CROPLAND/PASTURELAND
230 CITRUS
410 CONIFEROUS FOREST
420 HARDWOOD FOREST
430 MIXED FOREST
440 PLANTED FOREST
450 CLEARCUT
500 WATER
610 WETLAND - CONIFEROUS FOREST
620 WETLAND - HARDWOOD FOREST
640 WETLAND - VEGETATED, NON-FORESTED
N
T 32 S
T 33 S

Further classifications may be found in Table 3.6-1

SOURCE: STUDY DATA

FIGURE 3.6-A

TABLE 3.6-1

EXISTING ACREAGE BY LAND USE AND COVER TYPE
(Acres)

Symbol	Land Use & Cover Type	Existing Acreage
111	Urban, single unit, low density	4
194	Abandoned mine piles	214
211	Row crops	810
212	Field crops	30
213	Improved pasture	6,876
231	Orange groves	566
4111	Cutover flatwoods, palmetto range	3,389
4121	Cutover longleaf pine/sandhill oaks	24
4221	Live oak, mixed understory	109
4222	Live oak, bahia understory	118
4223	Upland mesic	660
4224	Transition mesic (bottomland hardwoods)	917
431	Mixed forest	126
4411	Planted pine - no ground vegetation	17
4412	Planted pine - bahia ground cover	204
4413	Planted pine - flatwoods understory	118
451	Clearcut bayhead	39
531	Unvegetated reservoirs	3
560	Other water areas	3
563	Cattle water ponds	6
6111	Pond cypress, isolated	78
6211	Gum-maple swamp	185
6212	Bayhead	418
6213	Bay strand	23
6214	Myrtle thicket	21
6215	Mixed hardwood swamp	198
6221	Disturbed gum-maple swamp	8
6222	Disturbed bayhead	84
6411	Isolated upland depressions	883
6412	Wetland depressions	157
	TOTAL	16,288

SOURCE: STUDY DATA AND FLORIDA LAND USE AND COVER CLASSIFICATION SYSTEM

Category	Acreage	Percent
o Land Communities (15 land use types)	14,004	86.0
o Land-Water Interface Communities (10 land use types)	2,054	12.6
o Water Communities (3 land use types)	12	0.1
o Developed Areas (2 land use types)	218	1.3
Total	16,288	100.0

The characteristics of native vegetation on the site have been altered by human activities. Water communities on the proposed mine site include man-made and naturally occurring ponds which are used for watering cattle and are stagnant and eutrophic. The Peace River and Bowlegs Creek, both of which are detrital-based heterotrophic systems (organisms consuming decaying matter), are included in the water community discussions but acreages were not estimated. Developed land (abandoned mines and residential areas), accounting for 1.3 percent (218 acres) of the total acreage, is excluded from this discussion.

3.6.1.2.1 Land Communities

Seven major types of land communities occupy 86 percent (14,004 acres) of the total acreage (16,288 acres) of the site.

Type	Acreage	Percent of Total Site Acreage
Coniferous Forest	3,413	20.9
Hardwood Forest	1,804	11.1
Mixed Forest	126	0.8
Planted Forest	340	2.1
Cropland/Pastures	7,716	47.4
Clearcut	39	0.2
Citrus	566	3.5
Total	14,004	86.0

Coniferous, hardwood, and mixed forests are found primarily in narrow strips along the property boundary, while agricultural areas occupy the interior portion of the site. Agriculture (cropland, pastures, and citrus) is the predominant land use on the site, accounting for 51 percent (8,282 acres) of the total acreage.

Coniferous Forest: Coniferous forest communities on the site are represented by two distinct types: cutover pine-palmetto flatwoods (3,389 acres) and cutover longleaf pine-sandhill oak (24 acres). In both communities, periodic fires serve to control plant species composition and release mineral nutrients to the soil. Controlled burning is a common practice for improving cattle grazing and timber production. Both communities have been moderately to heavily logged, and as a result their biomass has been reduced. Cattle foraging, ditching, and road construction have modified local water regimes and altered remaining understory associations, resulting in local invasion by hardwoods and low floral and faunal diversity. Decreased plant diversity and biomass have reduced the nutrient recycling function of this community by decreasing the amount of plant material available for decay and release of nutrients. Animal species most commonly occurring in these communities include the nine-banded armadillo, hispid cotton rat, pine warbler, rufous-sided towhee, pine woods treefrog and black racer.

Hardwood Forest: Four subtypes of the hardwood forest association exist as components of either xeric (dry) or mesic (moist) hammocks on the site. The xeric hammock type is represented by live oak with mixed understory (109 acres) and live oak with bahia understory associations (118 acres). Plant and animal diversity are typically low in these communities. The upland mesic association (660 acres) is a transition between the xeric live oak associations and bottomland hardwoods (917 acres). Heavy cattle usage has reduced the level of plant and animal diversity and productivity in these associations. Typical wildlife species occurring in these associations include the eastern mole, gray squirrel, green snake, oak toad, pileated woodpecker and red-bellied woodpecker.

Mixed Forests: The mixed forest communities (126 acres) occupy well-drained sandy soils along the Peace River and Bowlegs Creek. Secondary growth of mixed forest has occured on previously logged hardwood forest areas. On the interior of the site, mixed forests have developed as a result of fire suppression or ditching to improve drainage in natural pinelands. Plant and animal diversity, biomass, productivity and nutrient availability in the mixed forests range from low to moderate. The blue jay, rufous-sided towhee, spadefoot toad, black racer, gray squirrel and southeastern pocket gopher are common inhabitants of this community type.

Planted Forests: Plantation pines (340 acres) are established on the site as row plantings in areas that have been burned, harrowed and cleared of vegetation. Plantations without ground cover or with bahia understory have low plant and animal diversities. Planted pine plantations with flatwoods understory have moderate plant diversity and low to moderate animal diversity.

Cropland/Pasture: Cropland/pasture is the predominant land use on the site, accounting for 7,716 acres, or 47 percent of the site, consisting of 6,876 acres of pasture and 840 acres of cropland. Grasses, the dominant vegetation cover, have replaced much of the native vegetation and are managed to increase productivity. The soil-binding root systems of pasture provide erosion and runoff control. Plant and animal diversity and biomass are generally low.

Clearcuts: The clearcut bayhead (39 acres) on the site occupies a shallow depression which formerly was a seepage outcrop zone. The seepage outcrop zone was the result of lateral, water table percolation from the adjacent sandy ridge which is now covered by improved pasture and orange groves. The absence of vegetative cover on this area results in a lack of plant diversity, biomass and wildlife useage.

Citrus: Citrus groves occupy 566 acres or 3 percent of the site. Most groves on the site are not at peak production due to advanced age, ground cover or poor management practices. Because citrus is an intensively managed cover type, plant diversity is low and the animal diversity varies seasonally with fruiting.

3.6.1.2.2 Land-Water Interface Communities

The land-water interface communities on site consist of three types. The acreage of each type is as follows:

Type	Acreage	Percent of Total Site Acreage
Wetland-coniferous forest	78	0.5
Wetland-hardwood forest	937	5.7
Non-forested, vegetated wetlands	1,040	6.4
Total	2,055	12.6

Forested wetland associations on site are scattered and occur primarily along streams. Vegetated, nonforested wetlands occur as small, isolated units in the site interior. Deep freshwater marshes function as the headwaters of streams in the south central portion of the property.

Wetland-Coniferous Forest: These communities exhibit zoned internal structure and develop in shallow plateau depressions where rainfall is the principal source of water. The depressions contain acidic, poorly buffered waters and are minimally influenced by groundwater. Complete drying of the depressions is common during the dry season, and flooding results from wet season rainfall. The associations on the site are a small three-acre stand and a large 75-acre cypress dome near the eastern boundary (Figure 3.6-A). Animal species found in these communities include least killifish, eastern mosquitofish, green treefrog, squirrel treefrog, white-eyed vireo and opossum.

Wetland-Hardwood Forest: Bayheads (525 acres) and mixed hardwood swamps (411 acres) are the major wetland forest associations on the site. Bayhead communities exist along tributaries where erosion of highly permeable sandy soils has cut below the top of the water table. These stands occur on sloping ground which drains to streams only during heavy precipitation. Mixed hardwood swamp associations on the site represent second growth stands in previously burned or logged bayheads. Both associations provide limited flood protection, sediment filtering and water purification. The isolated and altered nature of the communities minimizes wildlife habitat value. Wildlife species which usually occur in these communities include the cotton mouse, raccoon, blue-jay, barred owl, little grass frog and striped swamp snake.

Wetland-Vegetated, Nonforested: Nonforested vegetated wetlands are represented on the site by shallow (883 acres) and deep water marshes (157 acres). Shallow marshes, or wet prairies, are flooded seasonally. The shallow marsh systems occur as numerous, small (approximately 10 acres or less) isolated depressions on the site. During prolonged rainfall, these depressions overflow and eventually drain into streams. Deep water marshes are characterized by floating-leaf aquatic species and generally develop on the margins of ponds, lakes, open marshlands and sloughs. The deep marsh usually has permanent standing water in some areas. Both marsh associations have been affected by cattle grazing and trampling. Wildlife species usually occurring in these communities include the rice rat, greater siren, chorus frog, and cottonmouth. The eastern mosquitofish, least killifish and everglades pygmy sunfish were collected from the deep marsh systems.

3.6.1.2.3 Water Communities

Both lentic (standing) and lotic (flowing) water communities occur on the proposed mine site. Lentic communities occupy less than 6.4 acres (0.1 percent) of the site and include man-made ponds and naturally occurring ponds. These ponds are eutrophic, supporting numerous algal blooms and exhibiting low plant and animal diversities. The primary function of the on-site ponds is water storage for cattle. Lotic communities include the Peace River, Bowlegs Creek and several small intermittent tributaries. Lotic systems on and adjacent to the site are detrital-based, heterotrophic systems and are typical of aquatic communities in the region.

Adjacent to the site the Peace River exhibits a steep gradient with increased stream flow and unstable substrate, resulting in lowered floral and faunal diversity. Water quality has been degraded as a result of agricultural, industrial and urban waste input. Bowlegs Creek provides drainage of surface runoff from much of the site. It has been altered by channelization and previous impoundment. On-site tributaries are intermittent with average annual flows of less than 5 cfs at the property boundary. They are limited in productivity and plant and animal diversity, and their primary benefit to the site is conveyance of excess water off of the property. Due to these factors, nutrient input to downstream areas and the streams' capacities to function as biological reservoirs for colonization of downstream areas are limited.

Peace River: The headwater region of the Peace River is characterized by a wide, easily flooded valley dominated by water-tolerant vegetation. Beginning in the vicinity of Fort Meade, the main channel is deeply incised with very few flood channels. The wetland zone is extensive downstream from Fort Ogden to the river's mouth. On the site, wetlands are either isolated from the river or limited to a narrow strip bordering the river. Flood flows generally are contained within the banks. These two factors limit the detrital input to the Peace River from the proposed mine site.

The algal community of the Peace River is qualitatively diverse but quantitatively low due to the natural dark brown color and the turbidity of the water, both of which limit light penetration. Aquatic macrophyte distribution and abundance in the Peace River adjacent to the proposed mine site are highly variable, depending on light and stream velocity. Forty-four benthic macroinvertebrate taxa were collected from the three areas of the Peace River. The major groups collected were oligochaetes (aquatic earthworms), dipterans (flies, mosquitoes, and midges) and molluscs (clams and snails). Diversity values (Shannon-Weaver) ranged from zero to 2.49 (values above three indicate unpolluted waters and values below one indicate polluted water) and equitability values (McArthur's Broken Stick Model) ranged from zero to 0.88 (values of 0.5 or less indicate degradation). Marked differences between sampling periods may be the result of sampling efficiency during high flow conditions and not seasonal effects. Diversity and equitability values indicate that the Peace River is a moderately stressed environment.

The Peace River basin contains at least 72 species of fish; about 35 species are present in southern Polk County. One exotic fish species, blue tilapia, is believed to be present in the Peace River near the project site. Waterfowl and wading birds are the primary bird groups found in this basin. Amphibians and reptiles include water snakes, turtles, frogs and alligators common to central Florida.

Bowlegs Creek: Bowlegs Creek is the largest sub-basin within the proposed mine site, occupying 43 percent of the site. Lake Buffum and Boggy Branch are the principal contributors to the creek system. Seven intermittent tributaries within the site also contribute to the creek's flow. A portion of the creek on the site has been channelized and was at one time impounded. Other influences on Bowlegs Creek include agricultural runoff, phosphate mining and the detrital input from adjacent wetlands during extreme precipitation events.

Bowlegs Creek, with its seasonal flow regimes, is similar to other detrital-based systems in the region with low to moderate floral and faunal diversity. Algal and aquatic macrophyte communities are similar to those occurring in the Peace River. These communities are limited by decreased light due to canopy overhang and dark coloration of the water. The channelized area where canopy overhang has been eliminated, however, supports a diverse algal and aquatic macrophyte community.

A total of 49 benthic macroinvertebrate taxa were collected from Bowlegs Creek during the two sampling periods. Oligochaetes, dipterans, molluscs, and coleopterans (beetles) were the major groups collected. Diversity values ranged from 1.13 to 3.6, and equitability values ranged from 0.29 to 1.07. Diversity and equitability values indicate that benthic communities in Bowlegs Creek are less stressed than those of the Peace River.

Eighteen fish species were collected from three sampling sites on Bowlegs Creek. The most abundant fish collected were the eastern mosquitofish, golden topminnow, southern brook silverside, and bluegill and other sunfish.

On-Site Tributaries: The headwaters of the ten tributaries found on the site originate in plateau depressions. The channels tend to be deeply incised and several have been channelized to enhance drainage. The annual average flows are less than 5 cfs and the tributaries exhibit highly variable flows due to seasonal rainfall and Surficial Aquifer seepage. These variable flows limit biotic community stability. Canopy overhang limits light penetration, which is important to algae communities, thereby decreasing primary production. These tributaries serve primarily as conveyors of excess water that accumulates in the plateau depressions during precipitation.

Algae and aquatic macrophyte communities of the intermittent tributaries are limited by poor light penetration due to dense canopy overhang. Fifty-eight benthic macroinvertebrate taxa were collected during two sampling periods on a representative tributary. Oligochaetes, molluscs, and dipterans were the dominant groups collected. Species diversity values ranged from 3.26 to 3.45 and equitability from 0.3 to 0.8. These diversity and equitability values indicate a relatively unpolluted (low oxygen demand) system.

Eleven species of fish were collected from the on-site tributaries that were sampled. The eastern mosquitofish and sailfin molly were the most commonly encountered species. The species found in the tributary systems are generally tolerant of low dissolved oxygen conditions.

Ponds: The proposed mine site contains both man-made and naturally occurring ponds. Cattle ponds exhibit low vascular plant and animal abundance and diversities due to cattle grazing and trampling. The ponds generally are eutrophic because of the high nutrient input from cattle use. Algal community abundance is high with many ponds supporting algal blooms. Naturally occurring ponds are fed by surface runoff and Surficial Aquifer seepage, and they occasionally go dry. The man-made ponds generally contain water year-round, and during extreme rains, the ponds serve as a source of nutrients and excess water to on-site tributaries. The water quality benefit provided by the ponds, however, is negligible due to their eutrophied condition.

3.6.1.2.4 Forestry and Agricultural Resources

On the site, agricultural resources, including pasture, cropland, and citrus, total 8,282 acres. Of the agricultural land, 6,876 acres are in improved pasture supporting a variety of native and introduced grasses. Row crops and field crops comprise 840 acres. Row crops are grown on several commercial farms near the southeast corner of the site. None of the soils on the site are designated as prime agricultural soils.

Citrus groves, primarily oranges, occupy 566 acres along Mt. Pisgah Road and in the northeastern corner of the site. Most of these groves are not at peak production due to advanced age and lack of adequate management. The Soil Conservation Service (SCS) has designated 446 acres of orange groves on the site as unique citrus areas. This acreage constitutes less than 0.5 percent of the unique citrus areas in Polk County.

Planted pine (slash pine) occupies approximately 340 acres (2.1 percent of the site). A survey of the forestry resources indicates that the site contains the equivalent of 4,153 cords of wood.

3.6.1.2.5 Migratory Wildlife and Game Species

Large game species potentially present on the site include the feral hog and the white-tailed deer. The feral hog population appears abundant on the site; however, no white-tailed deer were observed. Small game species consist primarily of mourning doves, bobwhites, gray squirrels, eastern cottontails and marsh rabbits. Fur-bearing species include the raccoon, bobcat, fox and skunk. Although the site is on the migratory flyway, the poor quality of marshes and the small size of water bodies preclude any appreciable use of the site by migratory ducks, wading birds or other waterfowl.

3.6.1.2.6 Rare and Endangered Species

Federally Threatened or Endangered Species: EPA provided the U.S. Fish and Wildlife Service, Jacksonville, Florida office with a description of Mobil's South Fort Meade Mine project and requested a list of endangered and threatened species which might occur in the project's area of influence (December 12, 1980). The U.S. Fish and Wildlife Service responded (December 18, 1980) to the EPA request with the following listing of species believed to be present in the area:

Bald Eagle - Endangered
Red-Cockaded Woodpecker - Endangered
Eastern Indigo Snake - Threatened
American Alligator - Threatened.

A summary discussion of each of the wildlife species' habitat requirements and their occurrence in the region is presented in the following paragraphs. No Federally threatened or endangered plant species were identified on site.

Southern Bald Eagle: The southern bald eagle is usually found in riparian habitats. The species nests are usually located near large bodies of water, although in the Florida interior they may nest on ponds and marshes. An eagle nest is present near the northeastern site boundary, but is not within the project boundaries (see Section 7, Figure 7.3-A). The proposed mine site does not have nesting habitat characteristic of this species, but may have areas being utilized for feeding.

Red-Cockaded Woodpecker: Red-cockaded woodpeckers are generally associated with mature to overmature longleaf pine stands. No mature stands of other pines which could provide habitat for this species exist on the site. There were no observations or reported sightings of this species. It is concluded that the possibility of a red-cockaded woodpecker occurring on the proposed mine site is extremely low to nonexistent.

Eastern Indigo Snake: The indigo snake was observed on the proposed mine site. This species prefers mesic forests and hardwood wetlands. They are also found in xeric habitats associated with burrows of the gopher tortoise and other species. The five sightings of indigo snakes were in mesic habitats along Bowlegs Creek, the Peace River, and near the on-site tributaries.

American Alligator: Alligators occur in small populations on the proposed mine site. This species is rather adaptive and was observed in a few cattle ponds and drainage canals. Poaching was evident as one alligator was found shot. There is adequate alligator habitat on the site but the habitat disturbances associated with cattle production have restricted this species' distribution on the property.

State Rare and Endangered Species: Twenty-four protected plants listed as endangered, threatened, or of special concern under Florida Statute 581.185 (Preservation of Native Flora of Florida) occur on the proposed mine site. The stated intent of Florida Statute 581.185 is "...to provide an orderly and controlled procedure for harvesting native flora from the wilds, thus preventing wanton exploitation or destruction of Florida native plant populations." The observed species fall into this category. Their distribution on site is restricted primarily to the periphery and wooded strips along the Peace River, Bowlegs Creek and tributaries. Much of this habitat has been severely degraded by cattle grazing and man-related activities such as drainage of wetlands, controlled burning, and clearing for agricultural and forestry interests, thus reducing the value of these areas for the listed species. None are presently in danger of extinction from the state.

Animal species listed below have been classified as endangered, threatened, or of special concern by the Florida Game and Fresh Water Fish Commission.

Wood Stork - Endangered
Florida Sandhill Crane - Threatened
Sherman's Fox Squirrel - Special Concern
Gopher Tortoise - Special Concern
Florida Burrowing Owl - Special Concern
Little Blue Heron - Special Concern
Snowy Egret - Special Concern
Louisiana Heron - Special Concern.

Wood Stork: One sighting of a wood stork occurred during the field studies. The cypress swamp was checked for nests, and none were found. The site habitat for this species is limited and of poor quality. It is likely that this sighting was non-characteristic, and the wood stork sighted was a visitor to the site.

Florida Sandhill Crane: This species was observed at four locations on the mine site. They are thought to be residents since the site contains pasture and freshwater marsh, their preferred habitat.

Sherman's Fox Squirrel: Two Sherman's fox squirrels were observed on site in uncharacteristic habitat. The small size and poor quality of longleaf pine habitats on site suggest that the fox squirrel population is small.

Gopher Tortoise: This species was observed on site. The gopher tortoise occurs in habitats on xeric, sandy soils; however, much of this land is now in pasture and there are only a very few active burrows left.

Florida Burrowing Owl: The Florida burrowing owl was observed on the proposed mine site. Almost all pastures on site with dry, sandy soil have active owl burrows. In one pasture 12 active owl burrows were found.

Little Blue Heron, Snowy Egret, and Louisiana Heron: These species were observed on the proposed mine site. All sightings included a low number of individuals and no rookery areas were found. Their wetland habitats on the site are either small or of poor quality.

3.6.1.2.7 Wetlands Classifications

Federal jurisdiction over wetlands is based primarily on Section 404 of the Clean Water Act of 1977 (33 USC, 1344), formerly known as the Federal Water Pollution Control Act, in which wetlands are defined, their uses and values described and a basis for regulation presented. Subsequently, vegetation lists were developed to assist in defining wetlands (U.S. Army Corps of Engineers, 1978), and a functional and physical approach to wetland classification has been developed (Cowardan et al., 1977). Reppert et al. (1979) provide a technical concept and procedure for evaluation of wetlands based on the requirements of the Clean Water Act. The procedure emphasizes ecosystem functional criteria and structural characteristics rather than the presence of certain species as criteria. This provides a basin-wide assessment among widely varying wetland types and allows an evaluation of a particular site as a unit within a larger system.

Areawide EIS: In the Final Areawide Environmental Impact Statement for the Central Florida Phosphate Industry (EPA, 1978) the U.S. Environmental Protection Agency established a wetlands categorization system to serve as a guideline for regulating the mining and reclamation of wetlands. This system entailed the assignment of wetlands on new source mine sites into one of three categories:

Category 1 -- Preserve and Protect: Wetlands that must be preserved and protected without disruption. Wetlands within and contiguous to rivers and streams having an average annual flow exceeding 5 cubic feet per second as well as other specific wetlands determined to serve essential environmental functions, including water quality. (These are wetlands that provide an essential synergistic support to the ecosystem and that would have an unacceptable adverse impact if they were altered, modified, or destroyed.) This generally includes cypress swamps, swamp forests, wet prairies, and certain freshwater marshes.

Category 2 -- Mine and Restore Equivalent Acreage: Wetlands that should be restored as wetlands to perform useful wetland functions. This also includes certain isolated noncategory wetlands that serve a primary function or several minor functions that may be maintained through proper restoration.

Category 3 -- Mine With No Restoration of Wetlands: Wetlands that would not have to be restored as wetlands. These are isolated and normally intermittent in nature, have less significant hydrological functions than Category 2, and minimal life-support value.

Site Evaluation: The wetlands identified on the proposed South Fort Meade Mine Site have been defined and evaluated according to the requirements of Section 404 of the Clean Water Act and then categorized according to the guidelines presented in the Areawide EIS (EPA, 1978).

The Reppert et al.(1979) procedure supplemented with a Delphi technique for weighting criteria was utilized to conduct a site-specific determination of wetlands and their functional significance on the proposed site. The Delphi technique and criteria weighting were employed because it was considered necessary to involve all key agency decision-makers in assigning weightings to wetland values and because the basic methodology assumed all wetland values criteria were equally important. Polling of the key decision-makers at an early stage in the evaluation process not only provided a relative ranking of wetland valuation criteria but also produced a consensus position for probable values of wetland units on the site. Site-specific conditions were used to assist in establishing the baseline from which the evaluation and categorization were made. The results of the wetlands study are summarized in Figure 3.6-B and in the following subsections. The complete report of the study entitled "South Fort Meade Mine Tributary Functional Analysis to Support an Assignment of EPA Wetland Categories" is available in limited supply from EPA, Region IV, EIS Branch.

Category 1 Wetlands: For Bowlegs Creek and the Peace River, the 5 cfs flow points occur upstream of the Mobil South Fort Meade Mine site. Therefore, wetlands within the areas contiguous to these systems were designated Category 1 to be protected from mining. These wetlands were limited in extent because of

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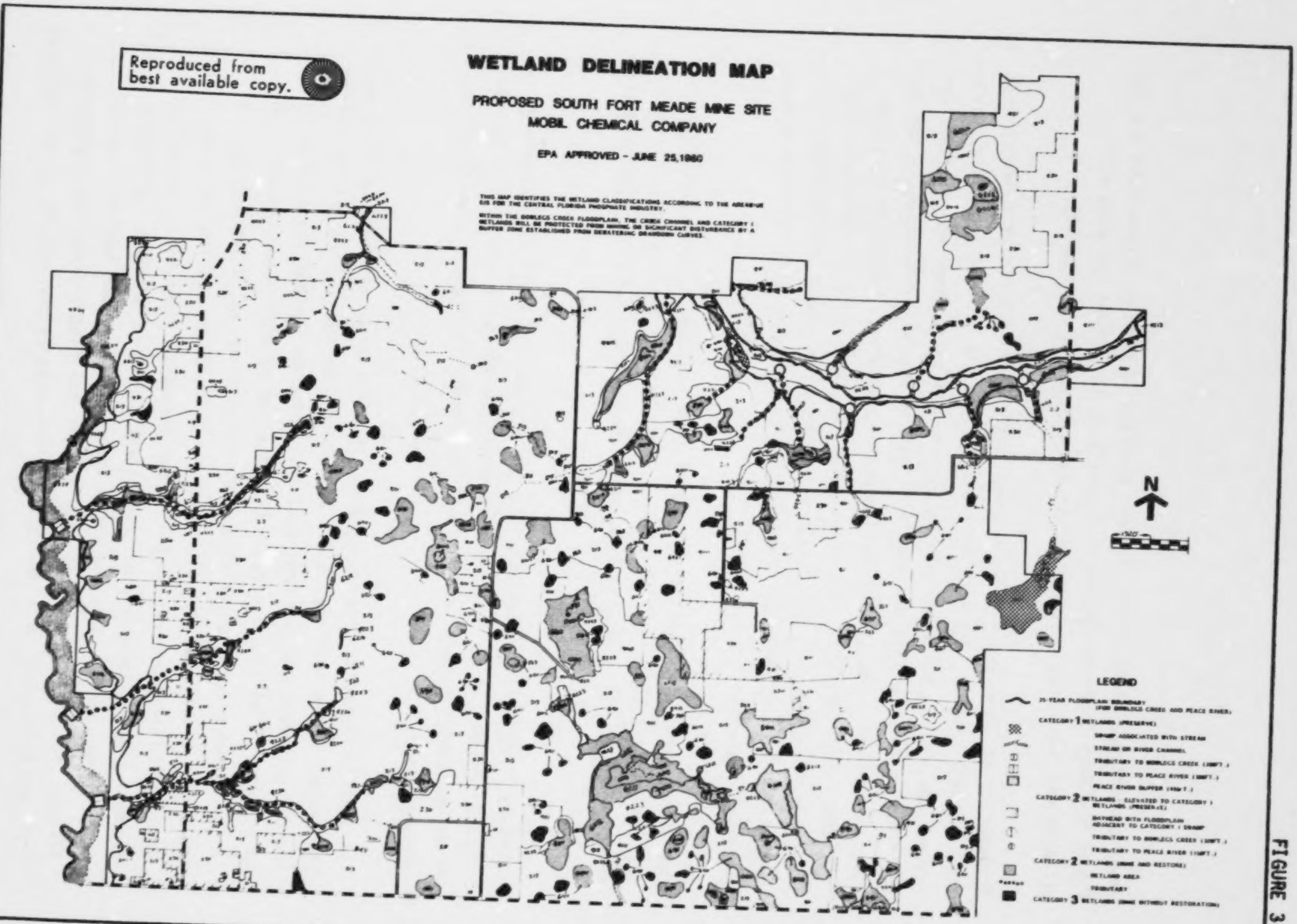
WETLAND DELINEATION MAP
PROPOSED SOUTH FORT MEADE MINE SITE
MOBIL CHEMICAL COMPANY
EPA APPROVED - JUNE 25,1980
THIS MAP IDENTIFIES THE WETLAND CLASSIFICATIONS ACCORDING TO THE AREAWIDE EIS FOR THE CENTRAL FLORIDA PHOSPHATE INDUSTRY.
WITHIN THE BOWLEGS CREEK FLOODPLAIN, THE CREEK CHANNEL AND CATEGORY 1 WETLANDS WILL BE PROTECTED FROM MINING OR SIGNIFICANT DISTURBANCE BY A BUFFER ZONE ESTABLISHED FROM DEWATERING DRAWDOWN CURVES.
N
LEGEND
25-YEAR FLOODPLAIN BOUNDARY (FOR BOWLEGS CREEK AND PEACE RIVER)
CATEGORY 1 WETLANDS (PRESERVE)
SWAMP ASSOCIATED WITH STREAM
STREAM OR RIVER CHANNEL
TRIBUTARY TO BOWLEGS CREEK (100FT.)
TRIBUTARY TO PEACE RIVER (100FT.)
PEACE RIVER BUFFER (400FT.)
CATEGORY 2 WETLANDS - ELEVATED TO CATEGORY 1 WETLANDS (PRESERVE)
BAYHEAD WITH FLOODPLAIN ADJACENT TO CATEGORY 1 SWAMP
TRIBUTARY TO BOWLEGS CREEK (100FT.)
TRIBUTARY TO PEACE RIVER (100FT.)
CATEGORY 2 WETLANDS (MINE AND RESTORE)
WETLAND AREA
TRIBUTARY
CATEGORY 3 WETLANDS (MINE WITHOUT RESTORATION)

FIGURE 3.6-B

local topography (steep banks) but are believed to meet or exceed both the EPA (1978) and Army Corps of Engineers (Reppert et al., 1979) criteria for valuable and important wetlands within the context of Section 404.

Tributaries to these two flowing systems had less than 5 cfs as a mean annual flow at their mouths. The species similarity of the tributaries and receiving systems was low. Interchange of species between the systems was minimal, and contribution of materials and species from the smaller tributaries to the much larger river and creek systems was shown to be minimal. Zero and very low flow conditions were usual occurrences for the tributaries. Therefore, the break between Category 1 and Category 2 systems was placed at the flood backwater point indicated by the elevation of the water line on trees along the Peace River and Bowlegs Creek.

Category 1 depression wetlands in the plateau included a large cypress dome near the eastern boundary of the site. This 75-acre dome is open in the center with several strata of vegetation and provides some fish and wildlife habitat.

Category 2 Wetlands: Category 2 wetlands include the small tributaries whose primary function is to convey excess flow from the site interior to the Peace River and Bowlegs Creek, and the smaller seasonally flooded plateau depression wetland units.

The small tributaries contributing to the Peace River and Bowlegs Creek from the property have less than 5 cfs annual average flow. They exhibit steep channel gradients and are dependent on low volume seepage for minimal flow maintenance. The biotic similarity, as based on benthic macroinvertebrates, is low between the tributaries and the Peace River and Bowlegs Creek. Flooding and ordinary backwater flow from the Peace River and Bowlegs Creek into these tributaries are restricted to the immediate vicinity of the tributary mouths. Lateral spreading or tributary flooding is severely restricted by the narrow deep channel incisions above the Peace River and Bowlegs Creek floodplains. The incisions effectively isolate the floodway wetland vegetation from the throughput of waters and further minimize the ability of the wetlands to provide water retention and storage, habitat and food chain production functions as an internal capability or in support of downstream units.

Category 2 depression units do not support a wide range of aquatic animal species because of their shallow seasonal flooding and isolation from stocks needed to recolonize the area when flooding occurs. Organic or peaty materials accumulate slightly or not at all in the depressions, although the soil may have a relatively high organic content. The wetland characteristics and vegetation in many of these units are maintained by adequate soil moisture conditions rather than by the sustained presence of surface water which would result in great functional importance of the units. This combination of factors results in lessened aquatic system value.

Category 3 Wetlands: These small depression wetlands are less than 5 acres each in size, typically are flooded for a shorter period than larger units, do not accumulate organic or peat layers because of limited water retention, and develop aquatic characteristics and values to a lesser degree than do more permanent units. Their connections to other units are minimal, and their ability to provide materials and services to other systems is correspondingly small. These units usually are isolated and scattered over the plateau, and are viewed as small, very shallow depressions with patches of herbaceous wetland species. Cattle grazing and periodic burning serve to further limit their development or alter their character and therefore minimize their value as wetlands.

3.6.2 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

3.6.2.1 The No Action Alternative

Under the no action alternative, terrestrial biological resources should remain basically the same as described in Section 3.6.1. Pasture would remain the major land use, and the vegetation on site would continue to be slowly altered by continued cattle foraging. Aquatic biological resources would be expected to remain the same as described in Section 3.6.1. However, natural succession would gradually modify habitats. Long-term changes in precipitation patterns could alter hydroperiods of wetlands and other aquatic habitats, resulting in possible shifts in plant and animal communities.

3.6.2.2 The Action Alternatives Including The Proposed Action

3.6.2.2.1 Mining Method Alternatives

Dragline (Mobil's Proposed Action): Biological resources on the South Fort Meade site would be affected by activities associated with the proposed action of dragline mining. These activities include clearing the land of vegetation, excavation of overburden and matrix, and construction of roads and other facilities to support the mining operations. Approximately 93 percent of the site (15,194 acres) would be disturbed over the life of the proposed mine. The disturbed and undisturbed acreages, by land use and cover type, are given in Table 3.6-2.

Land Communities: The seven major types of land communities occupy 86 percent (14,004 acres) of the total acreage of the site. Of this, 93.2 percent of the land communities (13,045 acres) will be disturbed during the life of the mine. The vegetation in these habitat types will be harvested and/or eliminated.

Type	Disturbed Acreage	Undisturbed Acreage	Percent Disturbed
Coniferous Forest	3,231	182	94.7
Hardwood Forest	1,140	664	63.1
Mixed Forest	121	5	96.0
Planted Forest	340	0	100.0
Cropland/Pastures	7,608	108	98.6
Clearcut	39	0	100.0
Citrus	566	0	100.0
Total	13,045	959	93.2

Sequential clearing of 50-acre parcels in front of each dragline would allow migration of larger and more motile fauna (such as the racoon, river otter, and birds) away from active mining areas to adjacent habitats. The adjacent habitat is probably at carrying capacity for populations of larger fauna, and the increases in population due to migration could result in more predation and disease and a decrease in reproduction. Populations could eventually stabilize with a resulting net loss in faunal resources. Some of the smaller and less motile species (such as amphibians, mice, and shrews) would be lost; however, many of these species are highly adaptable to habitats created during the mining process and reclamation.

TABLE 3.6-2

DISTURBED AND UNDISTURBED ACREAGE BY LAND USE AND COVER TYPE

Symbol	Land Use & Cover Type	Disturbed Acreage	Undisturbed Acreage	Percent Disturbed
111	Urban, single unit, low density	4	0	100
194	Abandoned mine piles	214	0	100
211	Row crops	810	0	100
212	Field crops	30	0	100
213	Improved pasture	6,768	108	98
231	Orange groves	566	0	100
4111	Cutover flatwoods, palmetto range	3,207	182	95
4121	Cutover longleaf pine/sandhill oaks	24	0	100
4221	Live oak, mixed understory	106	3	97
4222	Live oak, bahia understory	11	107	9
4223	Upland mesic	626	34	95
4224	Transition mesic (bottomland hardwoods)	397	520	43
431	Mixed forest	121	5	96
4411	Planted pine - no ground vegetation	17	0	100
4412	Planted pine - bahia ground cover	204	0	100
4413	Planted pine - flatwoods understory	118	0	100
451	Clearcut bayhead	39	0	100
531	Unvegetated reservoirs	3	0	100
560	Other water areas	0	3	0
563	Cattle water ponds	6	0	100
6111	Pond cypress, isolated	3	75	4
6211	Gum-maple swamp	163	22	88
6212	Bayhead	410	8	98
6213	Bay strand	23	0	100
6214	Myrtle thicket	15	6	71
6215	Mixed hardwood swamp	198	0	100
6221	Disturbed gum-maple swamp	8	0	100
6222	Disturbed bayhead	84	0	100
6411	Isolated upland depressions	869	14	98
6412	Wetland depressions	150	7	96
	TOTAL	15,194	1,094	93

SOURCE: STUDY DATA

Land-Water Interface Communities: Three major land-water interface communities occupy approximately 12.6 percent (2,054 acres) of the proposed mine site. During the life of the mine 93.6 percent (1,923 acres) will be disturbed.

Type	Disturbed Acreage	Undisturbed Acreages	Percent Disturbed
Wetland Coniferous Forest	3	75	3.8
Wetland Hardwood Forest	901	36	96.2
Non-Forested, Vegetated Wetlands	1,019	21	98.0
Total	1,923	132	93.6

The preserved wetlands (132 acres) are primarily the large (75 acre) cypress dome on the eastern edge of the property and those wetlands within the buffer strips along the Peace River (450 feet each side) and Bowlegs Creek (300 feet each side) as shown in Figure 3.6-B.

Water Communities: Impacts on the aquatic ecosystems from dragline mining include eliminating 9 of the 12 acres (75 percent) of the ponds on site. Additionally, dragline mining will destroy aquatic habitat by eliminating 60,000 linear feet of stream channel originating on the site. The Peace River and Bowlegs Creek would not be mined; however, alteration of stream flow would result from mining adjacent areas. In sections of the on-site tributaries not subject to mining, aquatic organisms may be affected by the mining of the rest of the tributary. The effects should be minimal since the protected areas are backwaters of the Peace River and Bowlegs Creek, the connection to which would allow fish and invertebrates the opportunity to move from the tributaries.

To gain access to mining parcels north of Bowlegs Creek, a dragline crossing would be located at an existing ford (Figure 2.1-A). Bowlegs Creek is scheduled to be crossed in 1999 and again in 2002 at the same ford. Woody vegetation in the corridor to the crossing would be cleared to about twice the width of the dragline (approximately 2 acres), and a culvert would be placed in the creek with earth backfilled around it. After each crossing, grass cover would be established to prevent erosion and runoff in the cleared corridor. After the second crossing in 2002, the culvert would be removed and the stream channel would be re-established. Tree species characteristic of wetlands would supplement the grass cover in the corridor.

Construction of the dragline crossing at Bowlegs Creek would affect downstream aquatic resources due to increased turbidity levels. High turbidity (suspended solids) effects on aquatic organisms would result from sedimentation, reduc-tion of light penetration and availability as a surface for growth of micro-organisms. Increased turbidity would be temporary at the crossing area and the short-term duration (several days) should not present a major impact.

Migratory Wildlife and Game Species: Because of habitat degradation and absence of large open water bodies, few migratory or game species occur on the site. The area is not managed for hunting; the land is privately owned and hunting is restricted. There is no commercial fishing on site, although there is sport fishing on Bowlegs Creek and the Peace River. Creation of large open water areas for clay settling during waste disposal would provide short-term habitat for migratory waterfowl. Creation of wetlands in larger units (over 100 acres) or acreage blocks as a result of reclamation would benefit aquatic species. Terrestrial species would benefit from the creation of more mixed forest. The primary land use of the reclamation plan is agriculturally oriented with some benefits to terrestrial game species.

Agricultural and Forestry Resources: Existing agricultural resources, including pasture, cropland and citrus, would be virtually eliminated during mining of the South Fort Meade Mine site. Of the 8,282 acres of agricultural land, 108 acres of improved pasture would be left undisturbed (Table 3.6-2). The 810 acres of row crops and 30 acres of field crops would be removed during mining. All of the 566 acres of citrus on site would be disturbed, including 446 acres of citrus designated by the Soil Conservation Service (SCS) as unique citrus areas.

Forestry resources (planted pine) presently occupy approximately 340 acres, representing the equivalent of 4,153 cords of wood. All planted pine acreage would be disturbed by mining. The wood would be harvested before the areas are mined.

Federal Rare and Endangered Species: No Federally protected plants were found on site. Regarding animal species, there is no designated critical habitat within the boundaries of the South Fort Meade Mine site. The U.S. Fish and Wildlife Service (December 18, 1980) supplied EPA with the following listing of species believed to be present in the area:

Bald Eagle - Endangered
Red-Cockaded Woodpecker - Endangered
Eastern Indigo Snake - Threatened
American Alligator - Threatened.

The southern bald eagle was reported to have been observed on site but the sighting could not be confirmed. However, an eagle nest was recently found outside the northeastern property boundary as shown on Figure 7.3-A. The proposed mine site may be used by the bald eagle for foraging, especially during the feeding of the young. Although the lands preserved along the streams may provide nesting habitat, the proposed mining may eliminate potential feeding areas.

The red-cockaded woodpecker is not believed to exist on the site and consequently should not be adversely affected by the project.

The eastern indigo snake was observed primarily in the wooded strips along the Peace River and Bowlegs Creek. An effect of preserving a 450-foot buffer strip along the Peace River and a 300-foot buffer from each bank along Bowlegs Creek would be to minimize impacts on the indigo snake populations occurring in these areas. The individuals seen along the tributaries on the mine site would be disturbed by mining, but the slow pace of the land clearing and mining would provide an opportunity for the snakes to evacuate. The mining of the mesic environments and other habitats of potential occurrence of this species would result in destruction of available habitat for this species which could reduce populations.

Alligators inhabit Bowlegs Creek, the Peace River and some wetlands on the site. Bowlegs Creek, the Peace River and the lower lengths of their tributaries would be preserved as previously discussed. Many of the other small water areas would be mined. The total acreage of wetlands after mining would be slightly more than the existing and habitat for this species would be increased after reclamation. Ponds, ditches, pools and settling basins would provide temporary habitat during mining for the alligators. The land clearing operation would be gradual enough to allow the alligators to move out of the areas to be disturbed. The development of the proposed mine would not significantly affect the alligator population.

State Rare and Endangered Species: Twenty-four protected plants listed as endangered, threatened, or of special concern under Florida Statute 581.185 (Preservation of Native Flora of Florida) were observed on the proposed mine site. Their distribution on site is restricted primarily to the periphery and wooded strips along the Peace River, Bowlegs Creek, and portions of the tributaries which are within the designated preservation areas (Figure 3.6-B). Populations of species on other portions of the tributaries scheduled for mining and those occurring on scattered locations would be eliminated. The impacts of the regional populations of these species would be minimal, however, as none are presently in danger of elimination from the state.

Animal species classified as endangered, threatened, or of special concern by the Florida Game and Fresh Water Fish Commission are listed below.

Wood Stork - Endangered
Florida Sandhill Crane - Threatened
Sherman's Fox Squirrel - Special Concern
Gopher Tortoise - Special Concern
Florida Burrowing Owl - Special Concern
Little Blue Heron - Special Concern
Snowy Egret - Special Concern
Louisiana Heron - Special Concern.

The wood stork habitat on site is small in extent and of poor quality. This species is not characteristic to the site and, therefore, should not be affected by the development of the proposed mine.

The Florida sandhill crane was observed at four locations on the mine site. They are thought to be residents since the site contains pasture and freshwater marsh, their preferred habitat. Mining would destroy their preferred habitat; however, reclamation would restore both freshwater marsh and pasture.

Two Sherman's fox squirrels were observed on site in uncharacteristic habitat. The small size and poor quality of longleaf pine habitats on site suggest that the fox squirrel population is small. Mining would eliminate this species' habitat on the project site.

The gopher tortoise was observed on site and occurs in habitats on xeric, sandy soils; however, much of this land is now in pasture and there are only a very few active burrows left. Mining would eliminate this species from the site; however, it is not expected that mining would have a significant effect on the gopher tortoise populations of the region.

The Florida burrowing owl was observed on the proposed mine site. Almost all pastures on site with dry, sandy soil have active owl burrows. In one pasture 12 active owl burrows were found. Mining would eliminate almost all (98.6 percent) of the pasture/cropland on site. Reclamation would result in restoration of pasture; however, soils may not be suitable for nesting of this species.

The little blue heron, snowy egret, and Louisiana heron were observed on the proposed mine site. All sightings included a low number of individuals and no rookery areas were found. Their wetland habitats on the site are either small or of poor quality, limiting viable population levels of these species on site. Mining will eliminate 93.6 percent of the wetland communities on site. Since there are no known nesting colonies on site, mining would have little impact on regional populations of these species.

Wetlands: Site-specific conditions were used to assist in evaluating the functional value of the wetlands present on the site. The study, "South Fort Meade Mine Tributary Functional Analysis to Support an Assignment of EPA Wetland Categories", indicated that the interior wetland units have minimal aquatic system value and regional significance. Wetland areas on the property were classified as either Category 1 (preserve and protect), Category 2 (mine and restore with equivalent acreage) or Category 3 (mine with no restoration to wetlands).

Construction of the proposed mine would result in the loss and protection of the following acreages of each of the wetland categories.

	Acres Existing	Acres Disturbed	Acres Protected	Percent Protected
Category 1	84	0	84	100
Category 2	1,601	1,553	48	3
Category 3	370	370	0	0
Total	2,055	1,923	132	6

Approximately 1,923 acres designated as wetlands (94 percent of total wetland acreage) wold be eliminated by mining (Table 3.6-2). The preserved wetlands (132 acres) are primarily the large (75 acre) cypress dome on the eastern edge of the property and wetland areas within buffer strips along the Peace River (450 feet each side) and Bowlegs Creek (300 feet each side), shown in Figure 3.6-B.

Bucket Wheel: The bucket wheel mining method would disturb the land surface in much the same way as the dragline method. Impacts on the biological resources resulting from bucketwheel mining would be essentially the same as those described for dragline mining.

Dredge: The dredge mining method requires clearing large tracts of land to provide dredge basins, resulting in a larger habitat loss at one time than the dragline mining method. Larger amounts of aquatic habitat are created, but the dredge basin pools are limited in their usefulness for many aquatic species, with the exception of migratory waterfowl due to small litoral zones. The impacts associated with dragline mining would also be expected with dredge mining. Additional impacts associated with dredging could result from dredge basin dike failure and subsequent release of turbid water into nearby surface water. This could adversely affect aquatic organisms by increasing suspended solids levels and other pollutants. Crossing Bowlegs Creek would be accomplished by transportation of the dredge along existing roads with minimal impact on the site's biological resources.

3.6.2.2.2 Matrix Transfer Alternatives

Pipeline (Mobil's Proposed Action): A pipeline method of transfer requires clearing corridors (approximately 12 feet wide) from the mining area to the plant facilities. Impacts resulting from clearing, construction and maintenance include habitat destruction, disruption or isolation of habitat units cut by the corridor, and altered migration and dispersal patterns of fauna. These impacts would probably be short-term because the pipeline corridor locations are changed as mining proceeds, and are usually maintained on disturbed lands which would require minimal clearing.

Mining on the north side of Bowlegs Creek would require a matrix slurry pipeline stream crossing of Bowlegs Creek during a four-year period of the mine life. If a break or leak occurred in the transfer line at the stream crossing, suspended solids, nutrients, sediment, and other contaminants would be increased and would damage aquatic and wetland ecosystems for a short time until corrective clean-up actions were taken. The use of valves and double-walled pipe as described in Mobil's proposed action would minimize the potential for a spill occurrence at the stream crossing.

Conveyor Belt: Impacts resulting from corridor routing of the conveyor belt system would be similar to those described for the pipeline system. Spills from the conveyor system would be more confined due to the solid nature of the material and would have less effect on terrestrial and aquatic ecosystems.

Truck: Roads for truck transfer of the matrix would have impacts similar to those discussed for the pipeline system, although the corridor (road) would be larger and more permanent than that for the pipeline. Although the potential for spills or leaks is less for this matrix transfer alternative, truck transfer would result in increased noise, fugitive dust and truck emissions, all of which could disrupt wildlife in the immediately adjacent area.

3.6.2.2.3 Waste Disposal Alternatives

Conventional Clay Settling Case (Mobil's Proposed Action): A primary concern with above-grade settling basins is the potential for dike failure. In the event of a failure, large volumes of clay could be discharged into Bowlegs

Creek and/or the Peace River, increasing turbidity, destroying natural biological communities, depositing sediments, and raising the concentrations of sulfates, fluorides, and total dissolved solids. The physical action of a spill would destroy vegetation and fauna at the spill site, while downstream aquatic organisms could be lost due to water quality degradation and excessive sedimentation. Studies of spills (Ware, 1969) indicate that approximately 90 percent of fish and most of the macroinvertebrates (except oligochaetes and chironomid larvae) in the spill zone were killed by blanketing from sediments. However, both investigators judged stream recovery as rapid. Terrestrial ecosystems within a spill zone would be damaged by flooding and destruction of ground cover and by the loss of less motile fauna (such as amphibians, mice and shrews) which would be smothered by the clay wastes.

During the life of the mine, approximately 8,170 acres (Table 3.6-3) of above-grade clay settling basins would be constructed with dike heights ranging from 25 to 45 feet and averaging 38.7 feet (Table 2.5-2). The worst case situation for a dike failure would be when the greatest amount of active above-grade settling acreage is in service. For the conventional clay settling case this occurs in mine years 12 through 14 when five basins (CS-4, CS-5, CS-6, CS-7 and CS-8) covering 2,760 acres are all active, operating in a flow-through settling mode (Figure 2.5-B and Table 2.5-3). Should a dam failure happen at this time, most of the clays released would probably flow into Bowlegs Creek or the Peace River because of the natural topography of the site. It is doubtful that any off-site property would be affected except for the roadways that pass through the site. The primary effect would be on the on-site and downstream sections of the Peace River and Bowlegs Creek. Smaller spills could occur from other isolated clay settling areas. The primary effect would still be degradation of water quality in the Peace River or Bowlegs Creek.

The technology used to construct the settling basin dikes has improved substantially during the past decade, reducing the likelihood of a dike failure. Thorough investigations of foundation and soil conditions at the location of the proposed dikes would be conducted on the South Fort Meade site prior to design and construction. The dikes would be continuously inspected and monitored during the active life of the settling basins. Mobil would comply with

TABLE 3.6-3

WASTE DISPOSAL ACREAGE

LAND TYPE	CONVENTIONAL CASE	SAND/CLAY CAP CASE	SAND/CLAY MIX CASE	OVERBURDEN/CLAY MIX CASE
Clay Settling (no cap)	6,681	--	1,642	--
Clay capped with Sand Tailings	1,489	--	--	--
Clay capped with Overburden		590		
Clay capped with Sand/Clay Mix (4:1)	--	7,580	--	--
Clay capped with Sand/Clay Mix (2:1)	--	--	3,185	2,847
Sand/Clay Mix or Overburden/Clay Mix (2:1)			3,512	5,492
Overburden Fill Plant Site and Graded Spoil	477	432	1,740	1,740
Sand Tailings Capped with Overburden	5,034	5,079	3,020	3,020
Water (Below-grade Clay Settling Areas)	1,513	1,513	2,095	2,095
Total	15,194	15,194	15,194	15,194

SOURCE: STUDY DATA

the regulations for design, construction and maintenance of earthen dams established by the Florida Department of Environmental Regulation (FAC Chapter 17-9).

The active settling areas would provide interim aquatic habitats. These areas would support common marsh species as volunteer plants invade them and would provide food sources for wildlife.

Sand/Clay Cap Case: The sand/clay cap waste disposal case has dike configurations similar to those of the conventional clay settling case; however, the average dike height is decreased two feet (Figure 2.5-C, Table 2.5-5). Flow through settling cannot be practiced with this waste disposal case; therefore, the amount of active above-grade settling acreage is reduced. Basin CS-3 would be used during the life of the mine as a dredge basin and would be filled and emptied several times during the mining activities. The greatest amount of active above-grade settling occurs in mine years 17 through 19 when CS-3 and CS-10, with a maximum area of 1,860 acres, are active (Table 2.5-6).

The potential for a dike failure occurring is decreased for the sand/clay cap waste disposal case compared to the proposed action because of the reduced active settling acreage (less than 1,860 acres compared to 2,760 acres) (Table 3.6-3). Should a spill event occur, the effect on biological resources would be similar to that described for the proposed action except that the volume of clay that could potentially spill would be reduced by 21 percent for the sand/clay cap waste disposal case compared to the conventional clay settling case. This reduction results from the lower average clay fill height with the sand/clay cap case (27 feet versus 34 feet).

Interim aquatic habitat provided by clay settling areas would be less for the sand/clay cap case than for the proposed conventional case bacause of the reduced active settling acreage.

Sand/Clay Mix Case: The sand/clay mix waste disposal case has 4,827 acres (Table 3.6-3) of above-grade clay settling basins with dike heights from 40 to 48 feet, and 3,352 acres of above-grade sand/clay mix basins with dike heights from 20 to 37 feet (Tables 2.5-8 and 2.5-10). The 4,827 acres of above-grade clay settling basins would be operated in a manner comparable to the sand/clay cap case and could not utilize flow through settling since these areas will be dewatered quickly in order to cap them with sand/clay mix. Two dredge basins would be constructed to provide clay for sand/clay cap material as well as sand/clay mix for the 3,352 acres of mix basins. The maximum amount of active settling acreage (2,450 acres) is between that of the conventional clay settling case (2,760 acres) and the sand/clay cap case (1,860 acres). Therefore, the potential for a dike failure occurring is greater than the sand/clay cap case but less than the conventional clay settling case.

The sand/clay mix case has two types of above-grade basins: sand/clay mix and conventional clay settling. The sand/clay mix material would consolidate more rapidly and would have higher density than the clay wastes impounded separately. This increase in density and consolidation would result in a decrease in flow characteristics of the mix material should a dike failure occur from one of the mix basins. Therefore, the volume of a sand/clay mix spill would be less than that expected from a clay settling basin spill. If a dike failure occurred from one of the clay settling basins the effect would depend on the quantity of material released but would be similar to that described under the conventional clay settling case.

The sand/clay mix case would have less active settling acreage resulting in less interim aquatic habitat than would be available with the proposed conventional disposal case.

Overburden Mix Case: The configuration, size and active settling acreage of above-grade basins with the overburden mix waste disposal case are similar to the sand/clay mix case; however, the extent of sand/clay mix impoundments would be increased to 7,670 acres. The average dam height would be 38 feet. The potential for a dike failure and resultant effect on surface water streams would be comparable to those described for the sand/clay mix basins under the sand/clay mix case.

3.6.2.2.4 Reclamation Alternatives

Conventional Clay Settling Plan (Mobil's Proposed Action): Mobil's proposed reclamation plan for the 15,194 acres disturbed by mining is illustrated in Figure 2.1-E. Improved pasture (11,413 acres) would be developed on above-grade settling areas and sand tailings fill areas with overburden cap. Upland mixed forest (1,271 acres), planted pine (453 acres) and forested stream channel (277 acres) would be developed in sand tailings fill areas with overburden cap. Freshwater swamp (478 acres) would be developed in above-grade clay settling areas, and freshwater marsh (1,302 acres) would be developed in below-grade clay settling areas capped with overburden.

With completion of reclamation, the total wetland acreage would be approximately 93 percent of that existing on the site; the combined forested stream channel acreage and wetland acreage would exceed the existing wetland acreage by approximately seven percent (Table 3.6-4). However, there would be a shift in the proportion of wetland type from freshwater swamp toward freshwater marshes. Specifically, reclamation would decrease freshwater swamp acreage by 426 acres (from 1,015 to 589) and increase freshwater marsh acreage by 283 acres (from 1,040 to 1,323). Reclaimed upland mixed forests would serve to expand the forested zones along the Peace River and Bowlegs Creek and provide dense forest stands. Final land use and cover for the conventional reclamation case would be predominately agriculture (Table 3.6-4), which is consistent with the present land use on the site. More specifically, land use is proposed as improved pasture with no provision for row crops, field crops, or citrus. Planted pine acreage would be increased from 339 to 453 acres.

The conventional settling case does not favor establishment of trees except in sand tailings, overburden, and cap areas. Waste clay disposal areas (no cap or mix) are best suited to perennial forage crops or pasture. The above-grade clay waste areas capped with sand would be reclaimed as pasture, but would also contain a mixture of hardwood and coniferous tree species. All reforestation would be done with a mixture of native tree species such as longleaf pine, live oak, and dogwood on well-drained sites and water oak, sweet gum, and slash pine on wetter sites. Planting density would be 400 trees/acre for upland reforestation.

At various locations thickets would be planted to provide escape cover for animals and generally increase diversity of plant cover. Stream channel reclamation would be done in sand tailings or overburden fill areas, and a normal water level channel and/or associated floodplain created. Shallow pools would be maintained in the created stream channels to provide permanent water supply for wildlife.

TABLE 3.6-4

ACREAGES BY LAND USE AND COVER CLASSIFICATIONS FOR RECLAMATION PLANS

Reclamation Case	Agricultural	Cutover Flatwoods and Bayhead	Upland Hardwood Forest	Upland Mixed Forest	Planted Pine	Water Areas	Forested Stream Channel**	Freshwater Swamp	Freshwater Marsh	TOTAL
Existing	8282	3452	1804	126	339	12	**	1,015	1,040	16,288*
Conventional (Proposed Action)										
Reclaimed	11,413	0	0	1,271	453	0	277	478	1,302	15,194
Undisturbed	108	182	664	5	0	3	0	111	21	1,094
TOTAL	11,521	182	664	1276	453	3	277	589	1,323	16,288
Sand/Clay Cap										
Reclaimed	11,003	0	0	1,451	536	0	279	504	1,421	15,194
Undisturbed	108	182	664	5	0	3	0	111	21	1,094
TOTAL	11,111	182	664	1,456	536	3	279	615	1,442	16,288
Sand/Clay Mix										
Reclaimed	10,313	0	0	1,826	431	0	263	746	1,615	15,194
Undisturbed	108	182	664	5	0	3	0	111	21	1,094
TOTAL	10,421	182	664	1,831	431	3	263	857	1,636	16,288
Overburden Mix	Similar to sand/clay mix case									

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* Includes 4 acres of residential land and 214 acres of abandoned mine.

** This term is not used in describing the existing (premining) case. For the reclamation cases, this term applies to the 200-ft wide reforested area, associated with the 60,000 lineal feet of recreated stream channels.

SOURCE: STUDY DATA

Short-term adverse reclamation impacts would result from recontouring, vegetation planting and construction of stream channels. Capping of settling areas would result in the loss of vegetation and wildlife established on clay settling and tailings fill areas. Construction activities would produce increased noise levels, fugitive dust and potential erosion problems, possibly affecting adjacent protected areas on Bowlegs Creek and the Peace River. Removal of native volunteer vegetation prior to replanting according to the desired vegetation schemes would result in the loss of large areas of interim habitat. However, these impacts are minor in terms of long-term reclamation goals.

Reconstruction of stream channels to approximate former drainage patterns on site could potentially create turbidity and sedimentation in the Peace River and Bowlegs Creek. The proposed action would minimize this impact by allowing complete vegetation to be established in the channels for filtering and reducing sediment loads and turbidity before connection with the downstream channel. Additionally, establishment of shallow depressions, where drainage would exist in the reclaimed waste disposal areas, would provide a filtering effect once vegetation is established. Establishment of streams or tributaries would provide drainage for surface water runoff from the reclaimed landforms, as well as avenues of dispersal for animals and detrital materials.

Sand/Clay Cap Plan: The sand/clay cap reclamation plan would reclaim the 15,194-acre disturbed area as follows: improved pasture (11,003 acres) would be developed in above-grade clay settling areas capped with 4:1 sand/clay mix and sand tailings fill areas with an overburden cap; upland mixed forest (1,451 acres), planted pine (536 acres), and forested stream channel (279 acres) would be developed in sand tailings fill areas with an overburden cap; freshwater swamp (504 acres) would be developed in above-grade clay settling areas; and freshwater marsh (1,421 acres) would be developed in below-grade clay settling areas capped with overburden.

The predominant land use for the sand/clay cap reclamation would still be agriculture (Table 3.6-4). However, the areas capped with a sand/clay mix (4:1 ratio) are less limited in their agricultural potential than either the uncapped conventional clay settling areas or the 2:1 sand/clay mix areas (see

Section 3.2 Geology and Soils). That is to say, although the proposed land use in each case is improved pasture, the surface soils composed of the 4:1 sand/clay mix should also allow the planting of field and row crops. More wetland acreage (8 percent) is proposed for this reclamation plan than for the conventional clay settling plan. Additionally, more upland forested areas are proposed for reclamation due to the suitability for shrub and tree planting of capped clays versus open or no cap on waste clay disposal sites. This would aid wildlife by committing more acreage to suitable habitat. Reforestation and revegetation would be the same as for the conventional plan. Stream channel creation would also be the same as for the conventional plan except that there would be less alteration of drainage areas from existing patterns.

Sand/Clay Mix Plan: The sand/clay mix reclamation plan would reclaim the 15,194 acre disturbed area as follows: improved pasture (10,313 acres) would be developed in above-grade sand/clay mix (2:1) areas, clay settling areas, and sand tailing fill areas capped with overburden; upland mixed forest (1,826 acres), planted pine (431 acres) and forested stream channel (263 acres) would be developed in sand tailings fill areas with an overburden cap; freshwater swamp (746 acres) would be developed in above-grade sand/clay mix (2:1) areas, clay settling areas and below-grade sand/clay mix (2:1) areas; and freshwater marsh (1,615 acres) would be developed in below-grade clay settling areas capped with overburden.

The predominant land use of the sand/clay mix case would be agriculture (Table 3.6-4). Soils would be more suitable for planting tree species in this plan than in the conventional plan. The sand/clay mix reclamation plan would result in 2,495 acres of upland hardwood and mixed forest being reclaimed, or 28.6 percent more than the conventional settling plan. More wetland acreage (2,361 acres or 33 percent more) would be reclaimed with the sand/clay mix plan than with the conventional plan. This would result in more wildlife habitat for invading and recolonizing animal species than would be available as a result of the two previously discussed reclamation plans.

Overburden/Clay Mix Plan: The overburden/clay mix reclamation plan would reclaim the 15,194-acre disturbed area essentially the same as the sand/clay mix plan. The major difference in impacts on biological resources between the overburden/clay mix and the sand/clay mix reclamation plans is the potential for additional tree planting. The conversion of the 1,642 acres of clay surface soils to sand/clay mix soils creates the potential for additional forest areas by planting or by natural colonization.

3.6.2.2.5 Water Source Alternatives

Groundwater (Mobil's Proposed Action): No impact on the biological resources is anticipated from the use of groundwater pumped from the Floridan Aquifer for the water source. Streams, wetlands, and other surface water resources would not be affected by this action.

Surface Water: This alternative would require impoundment of portions of Bowlegs Creek, reducing and possibly eliminating stream flow and materials contribution from Bowlegs Creek to the Peace River. The floodplain characteristics of Bowlegs Creek to the Peace River and downstream of the impoundment would be altered. Impoundment would require clearing of preserved wetlands and stream buffer zones for reservoir construction. The surface water alternative would also result in adverse impacts on the ecological communities of Bowlegs Creek by eliminating the lotic biological resources now associated with it. However, an area of open water habitat would be created resulting in a more stable lentic biological community.

3.6.2.2.6 Plant Siting Alternatives

Gilshey Branch (Mobil's Proposed Action): The biological impacts of locating the beneficiation plant on the flatlands between Gurr Run and Gilshey Branch would be confined to removal of the vegetation in the area of construction. The proposed plant location is in an area now utilized for pasture with minimal plant and animal value; therefore, no significant effects on wildlife are anticipated from this action.

Other On-Site Locations: Locating the plant near preserved areas on the property would increase the potential for adverse impacts, such as dust, noise, and spillage, on the biological systems. Other on-site locations could have similar impacts to the proposed action if they were centrally located and had a pasture cover.

3.6.2.2.7 Water Discharge Alternatives

Peace River (Mobil's Proposed Action): Discharge from the clear water pool would occur primarily during extreme rainfall events. Discharge to the Peace River at average flow could adversely affect aquatic biological resources downstream of the discharge point since suspended solids loads at maximum discharge may damage aquatic organisms. However, discharge should occur only during extreme rainfall events when increased dilution would occur due to the high flow condition in the receiving stream.

Bowlegs Creek: Flows at maximum discharge would be eight times the annual mean flow of Bowlegs Creek, resulting in very little potential for dilution of discharge constituents. The excessive flows could increase turbidity levels and initiate scouring, both of which would adversely affect aquatic life in downstream portions of the creek.

3.6.2.2.8 Product Transport Alternatives

Railroad (Mobil's Proposed Action): Land clearing, construction and continual use of the railroad spur would disturb natural communities along the proposed route and would disrupt local animal migration and dispersal patterns in habitats adjacent to the route. Noise associated with this transport process would also adversely affect wildlife in adjacent habitats. The proposed route requires a crossing of the Peace River. Construction of a bridge would temporarily affect aquatic biological communities of the Peace River as a result of sedimentation and turbidity. Construction of bridge approaches would affect the floodplain vegetation, but impacts should be minimal as there are no extensive floodplain wetlands associated with the Peace River at the railroad crossing site.

Truck: Existing road systems would be used to transport products by truck; therefore, no further impacts from corridor routings are anticipated. Fugitive dust and noise would increase due to increased vehicular use of the road systems, resulting in adverse impacts to vegetation resources and disturbance of wildlife in adjacent habitats.

3.7 HUMAN RESOURCES

3.7.1 THE AFFECTED ENVIRONMENT

3.7.1.1 Demographics and Economics

Both Polk and Hardee Counties experienced growth between the 1970 Census and a 1978 University of Florida estimate. Polk County is estimated to have had a 25 percent increase in population between 1970 and 1978, with the population growing from 227,222 to 284,388. The population in Polk County is made up of approximately 80 percent permanent residents, 13 percent transients and 7 percent tourists. Hardee County experienced a slightly smaller increase with the 1970 Census population of 14,889 growing to an estimated 17,827 in 1978, representing a 20 percent growth over the eight-year period. Hardee County has a permanent population of 97 percent, with 1 percent transients and 2 percent tourists.

Polk County experienced a 26 percent increase in housing units between 1960 and 1970, and an additional 20 percent increase between 1970 and 1973. In 1973, there were 97,713 housing units with 2.63 persons per unit. Hardee County had 6,002 housing units in 1973 with 2.85 persons per unit.

Between 1968 and 1978 Polk County's labor force increased 39 percent from 89,600 to 124,654, with 8.4 percent unemployment in 1977. The labor force in Hardee County rose from 4,300 in 1967 to 8,438 in 1970; unemployment was 6.1 percent in 1978. An examination of the 1977 average wage and salary income by industrial division reveals that employees of the mining industry have the highest average wages. Polk County mining workers received an average annual wage of $14,613, approximately 46 percent more than the average state-wide industrial wage of $10,032. Industrial wages averaged $10,023 in Polk County and $7,980 in Hardee County.

Polk County levies an ad valorem tax on the value of phosphate producing land and a property tax on the value of land, buildings, and equipment. The state levies a 10 percent severance tax on the value of a product at the point of severance. Other taxes which the state levies include a 4 percent sales tax on materials and supplies, a 5 percent corporate income tax on net income, and a motor fuel tax. The Federal government levies an income tax on employee income and corporate income.

3.7.1.2 Cultural Resources

An archaeological and historic investigation of the South Fort Meade site was performed by personnel from the Department of Social Services, Florida State Museum, University of Florida. The investigation consisted of a search of articles, maps and monographs pertaining to the physical and social development of Polk County in general, and Bowling Green, Fort Meade and Wauchula specifically. In addition, archaeological survey and site reports, the Fort Meade site file, recent EIS statements, information from private collectors and local residents, and theoretical and substantive geological, ecological, and anthropological material were considered.

During the archaeological study, two aboriginal ceramic period sites were encountered, as were isolated chert flakes and one isolated unifacial scraper. Two other sites were encountered from post-Archaic periods and were probably task-specific. One site contained two non-utilized chert flakes and six sand-tempered, plain sherds. The other site contained two very chalky sherds, nine non-utilized flakes and one Pinellas point. These isolated sites are thought to result from single cultural events representing hunting activities. The survey area appears to have been one of minimal aboriginal activity.

The historic sites encountered during the study were 15 nineteenth and twentieth century homesteads and outbuildings. Two were remnants of a twentieth century turpentine still and one was a house for black workers employed at the still. Parts of a tramway built for use by logging companies were also found. Other remnants of human activity are a result of nineteenth and twentieth century cash-crop truck farming and mining.

3.7.1.3 Community Services

During the 1978-79 school year, Polk County supported 104 educational facilities consisting of 57 elementary, six middle, 16 junior high, 11 senior high and two special education schools. The student to teacher ratio was 20.5 to 1. Three vocational-technical schools and nine adult centers were also operated in Polk County.

Hardee County had four elementary schools, one junior high school and one high school with a full time certified staff of 247 in the 1975-76 school year. The student to teacher ratio for the 1975-76 school year was 19.8 to 1. Southern Florida College, located in Lakeland, presents opportunities for higher education.

Fort Meade and Bowling Green, the two closest communities to the site, provide their residents with sewer services and water supply from groundwater withdrawals. Recreational facilities in the area consist of 71,210 acres in Polk County and 771 acres in Hardee County. The local communities support and maintain police and fire protection. Hospitals are located in Avon Park, Bartow, Sebring, and Wauchula.

Electrical energy is supplied to the Polk/Hardee County area by a network of high-voltage transmission lines interconnecting the load areas of more than 35 power plants owned by various companies. A 35 MW (megawatt) oil-fired power plant located in Avon Park is owned by the Florida Power Corporation (FPC). Interconnected power facilities are located in Wauchula, Bartow, and Sebring.

3.7.1.4 Land Use

Agriculture and phosphate mining are the major bases of the economy in the area of the proposed mine site. Most of the land is rural with large tracts of agricultural land for cattle grazing and citrus production. Mining occurs on several tracts near the South Fort Meade site. The many freshwater lakes, rivers and wildlife habitats contribute to the aesthetics and quality of life in Polk and Hardee Counties.

Land use in Polk County is predominantly agricultural with citrus groves, pastures and croplands occupying 42 percent of the land area. Approximately 18 percent of the county has been mined or is being developed for mining by phosphate companies. Developed land (residential, commercial, industrial, etc.) accounts for about 10 percent of the land use in Polk County. The other 30 percent is made up of miscellaneous vacant land and water bodies. Only one percent of Hardee County is developed for urban use, with the majority of the county, 56 percent, vacant land composed of forests, rangelands and wetlands. Agricultural uses occupy approximately 43 percent of the land area. Minimal mining has occurred in Hardee County.

Approximately 51 percent of the 16,288-acre proposed mine site is used for agricultural purposes. Of this, about 47 percent of the site is planted in pasture and crops and 4 percent in citrus groves. A miscellaneous vacant category includes forest, shrubland, grassland, rangeland and wetlands, making up 48 percent of the property. The remaining 1 percent of the property is covered with water, developed for residential home sites or vacant for power-line transmission.

The Polk County Comprehensive Plan, prepared in 1979, identifies the following objective and policies concerning mining areas:

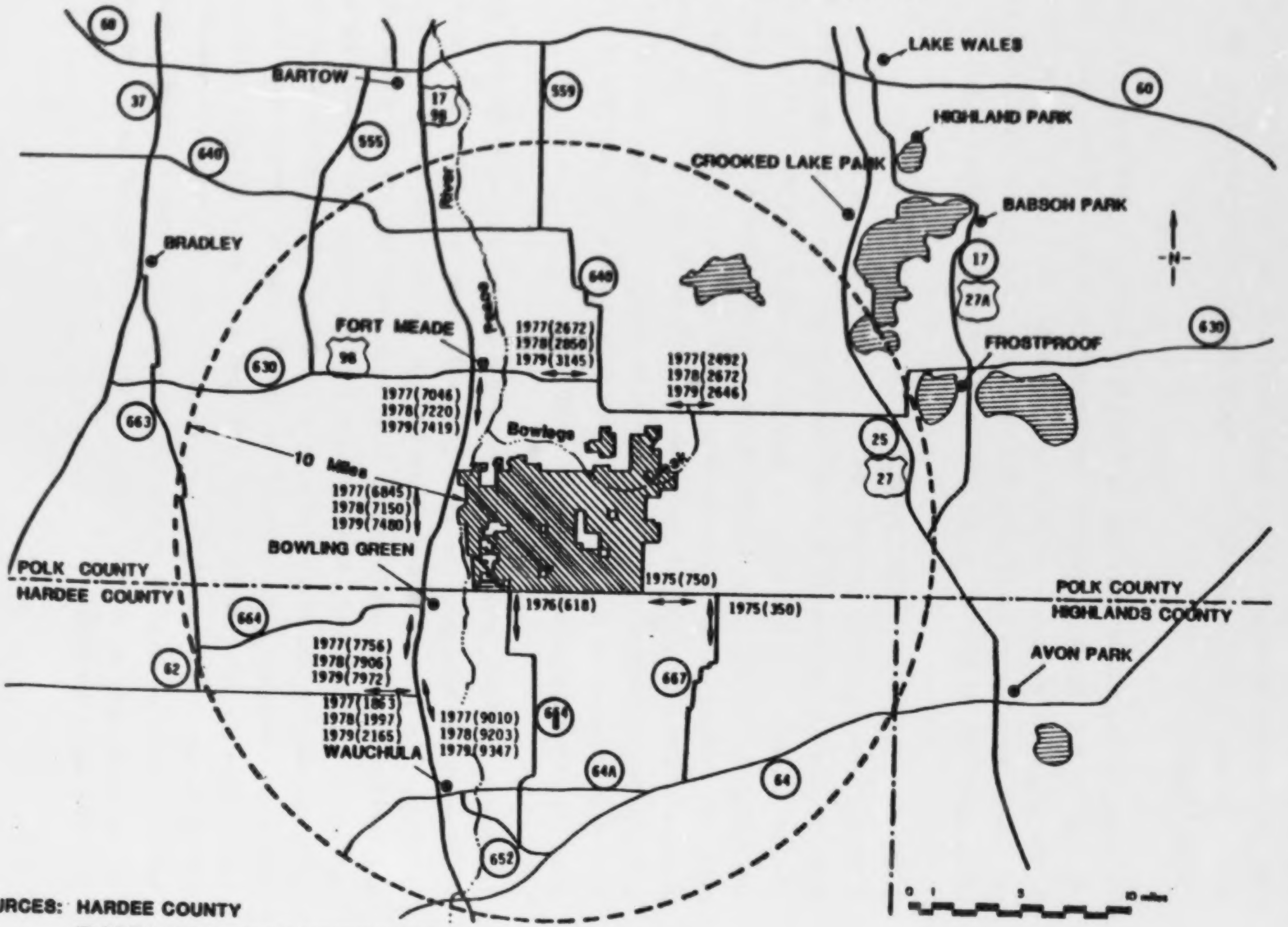
> Objective - Mining Areas:
>
> To promote continued mining and processing of minerals on lands now in active production or being held for that purpose, as a support to the sound economic base of Polk County.
>
> Policies:
>
> 1. Protect, as much as possible, active phosphate mining and processing areas and reserve lands being held for mining from the establishment of incompatible land uses in nearby locations.
> 2. Encourage provision of essential support services and activities necessary to continued mining productivity in Polk County.
> 3. Encourage and promote, through existing regulatory control, the establishment and maintenance of mining and processing procedures that will minimize the emission of pollutants into the air, soil and water resources of Polk County.
> 4. Promote and encourage, through existing regulatory controls, the preplanning of mining operations to facilitate reclamation of lands for beneficial uses.
> 5. Encourage and promote the restoration of previously mined lands for beneficial uses.

In summary, the future land use plan provides for the mining of lands held in reserve and the protection of these lands from adjacent incompatible uses.

3.7.1.5 Transportation

Highway vehicles are the primary means of passenger and small freight movement in both Polk and Hardee Counties (Figure 3.7-A). North of the proposed mine

TRANSPORTATION FACILITIES AND AVERAGE DAILY TRAFFIC (ADT)


60
37
BARTOW
17
98
555
559
640
LAKE WALES
60
HIGHLAND PARK
CROOKED LAKE PARK
BABSON PARK
17
27A
N
BRADLEY
River
Peace
640
630
FORT MEADE
98
630
1977(2672)
1978(2850)
1979(3145)
1977(2892)
1978(2672)
1979(2646)
FROSTPROOF
1977(7046)
1978(7220)
1979(7419)
663
Bowlegs
Creek
25
27
10 Miles
1977(6845)
1978(7150)
1979(7480)
BOWLING GREEN
POLK COUNTY
HARDEE COUNTY
1975(750)
1976(618)
1975(350)
POLK COUNTY
HIGHLANDS COUNTY
664
62
1977(7756)
1978(7906)
1979(7972)
667
AVON PARK
1977(1863)
1978(1997)
1979(2165)
1977(9010)
1978(9203)
1979(9347)
WAUCHULA
64A
64
652
0
1
5
10 miles

SOURCES: HARDEE COUNTY
FLORIDA DEPARTMENT OF TRANSPORTATION, BUREAU OF PLANNING

FIGURE 3.7-A

site U.S. Route 98 carries traffic east and west. West of the site U.S. Route 17 provides for north and south flow. On the southern border of the site, also the Polk/Hardee County line, State Route 664 carries traffic east and west. Various light and medium duty county roads interconnect these basic thoroughfares.

The Seaboard Coast Line provides rail freight service in the area with tracks adjacent to U.S. Route 17 running through Bowling Green and Fort Meade. Most of the phosphate mined in the area is transported to the Port of Tampa by railroad. The Port of Tampa provides major dry bulk loading facilities from which cargo can be shipped to ports in the United States or overseas.

3.7.2 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

3.7.2.1 The No Action Alternative

Mobil's existing Fort Meade Mine will cease production during the latter half of this decade. If Mobil does not develop the South Fort Meade site as a replacement mine, the contribution to the economy of the area through employment, tax payments, and other economic factors will decline and eventually cease with the completion of mining at the Fort Meade facility. The current 175 permanent employees and the $3.7 million payroll (1980 dollars) at the Fort Meade Mine would be phased out. The $5.5 million in taxes (1980 dollars) from the Fort Meade Mine would also be lost.

The primary economic effect of the no action alternative would be felt by the Mobil employees dependent for their jobs and income on the phosphate mining industry. The loss of secondary income from indirect employment and material and service suppliers would amount to approximately $50 million (1980 dollars) per year. Land use would likely remain in its present agricultural state, although some wetland areas and other miscellaneous land categories on the site might eventually be developed for pasture or other agricultural land uses. Property values without the developed mine would decrease relative to the value for phosphate mining. The no action alternative would reduce traffic levels on local roads and the Seaboard Coast Line Railroad. Demands for services such as housing, schools, fire protection, police and medical services would decrease.

3.7.2.2 The Action Alternatives Including the Proposed Action

Impacts on the human resources in the area of the proposed mine site have not been evaluated in the same subsystem format as the other resources previously presented. The human resources evaluation presents the no action alternative versus Mobil's proposed action except in the discussion of land use where alternative reclamation plans are discussed and product transport where alternative modes of transportation are discussed.

3.7.2.2.1 Demographics and Economics

During the two construction periods at the South Fort Meade site, construction labor would average 400 employees with a peak labor force of 600 employees. Approximately 95 percent of the construction labor would come from the existing central Florida labor pool, providing ongoing employment for construction industry personnel in the area. Permanent operating employment is expected to stabilize at 233 employees, most of whom would be transferred from the existing Fort Meade Mine while the rest would be hired from the local labor pool. Total regional secondary employment generated by operation of the facility is projected to be between 900 and 1,430. Total secondary income from indirect employment is estimated at $350 million.

Construction labor expenditures for the two phases of development would total $240 million (1980 dollars), with the total labor payroll at $70 million. The annual operations payroll for the mine would be approximately $5.1 million (1980 dollars) per year. Most of the construction labor expenditures, and essentially all of the operations expenditures, would accrue to the region.

Mobil's proposed South Fort Meade Mine would generate revenue for Polk County through ad valorem taxation and redistribution of sales tax collected in Polk County. Once operations commence, the annual revenue generated (in 1980 dollars) by the proposed mine is estimated at $2.2 million in property tax and $300,000 in sales tax. Approximately 35 percent of the ad valorem revenue would go to the general county fund, 62 percent to the school district, and 3 percent to the SWFWMD and the Peace River Basin Water District. The mining operation would also generate about $5.6 million in severance tax revenue annually, of which 50 to 75 percent would go to the General Revenue Fund of the State of Florida. The remainder of the revenue would be credited to the Land Reclamation Trust Fund and the Florida Institute of Phosphate Research.

3.7.2.2.2 Cultural Resources

Pursuant to Section 106 of the National Preservation Act, EPA consulted with the State Historic Preservation Officer (SHPO) and the Florida Division of Archives, History and Records Management, to obtain an evaluation of the cultural resource impacts on the Mobil project. Based on the inventory conducted by Florida State Museum authorities, archival and field evidence indicates the absence of prehistoric or historic resources of National Register quality within the proposed mine site's boundaries. The site is not close to any known historic or archaeologic site. The SHPO provided EPA his opinion that the proposed South Fort Meade mine is unlikely to affect any archaeological or historic sites listed, or eligible for listing, on the National Register of Historic Places, or otherwise of national, state or local significance (Percy, 1980).

3.7.2.2.3 Community Services

The proposed South Fort Meade facility will essentially be a replacement mine for a currently active Mobil mine in Polk County. The labor force for the new facility will generally be drawn from that of the phased-out existing facility and would not result in an influx of people that would impose additional demands on the present community service facilities. Therefore, the new facility is considered not to have an impact on community services.

3.7.2.2.4 Land Use

The principal socio-economic issue associated with waste disposal and reclamation is the ultimate use of the land after mining. Table 3.7-1 presents a summary of the land use units that the reclaimed mine site would contain as a result of each waste disposal/reclamation plan (the proposed action and three alternatives). Due to the rural setting of the mine site, the ultimate utility of the site for urban purposes is not as important to the economy of the area as the use of the land for agriculture.

Conventional Clay Settling Plan (Mobil's Proposed Action): During the life of the mine, 15,194 acres of the 16,288-acre site would be disturbed. The undisturbed areas of the site are wetlands and flatwoods, considered to be

TABLE 3.7-1

LAND USE CLASSIFICATION OF RECLAIMED LAND
(Acres)

Land Use/ Cover Classification	Existing Use	Conventional Plan	Sand/Clay Cap Plan	Sand/Clay Mix Plan	Overburden/Clay Mix Plan
Agricultural Lands	8,282	11,521	11,111	10,421	10,421
Cutover Flatwood	3,452	182	182	182	182
Upland Hardwood Forest	1,804	664	664	664	664
Upland Mixed Forest	126	1,276	1,456	1,831	1,831
Planted Pine	339	453	536	431	431
Water Areas	13	3	3	3	3
Forested Stream Channel	-	277	279	263	263
Freshwater Swamp	1,014	589	615	857	857
Freshwater Marsh	1,040	1,323	1,442	1,636	1,636
Developed	218	0	0	0	0
TOTAL	16,288	16,288	16,288	16,288	16,288

SOURCE: STUDY DATA

economically unproductive in their current use. All of the land area on the site that is currently economically productive (cropland, improved pasture, citrus groves and planted pines), about 54 percent of the total site, would be disturbed as a result of mine implementation.

With the completion of the conventional reclamation plan, agricultural land would increase 39 percent, from 8,282 acres to 11,521 acres. Most of the flatwoods (3,452 acres) on the site are presently unmanaged pasture areas and with the conversion of these areas to managed agricultural units, the economic productivity of the whole mine site would increase over current levels. The 566 acres of citrus groves on the site (0.3 percent of the citrus producing land in Polk County) would be lost. Planted pine areas would increase from 339 acres to 453 acres upon completion of reclamation, while other forested areas would remain essentially unchanged. Freshwater swamps and marsh areas would also remain with approximately the same acreage.

Sand/Clay Cap Plan: The sand/clay cap reclamation plan would designate 11,111 acres as agricultural land, representing a 34 percent increase over that existing. Because the 7,580 acres of 4:1 sand/clay cap material would be more tillable than the 6,681 acres of clay in the conventional plan, the sand/clay cap plan has a better potential for economic productivity through agricultural use than the reclaimed land in the conventional plan. Planted pine acreage would increase from the existing 339 acres to 536 acres with the other forested areas increasing only slightly in size. Freshwater swamps and marsh areas would remain essentially unchanged.

Sand/Clay Mix Plan: This reclamation plan would result in 10,421 acres devoted to agricultural use, representing a 26 percent increase over the existing amount. The 3,512 acres of 2:1 sand/clay mix material would be tillable which would allow for greater agricultural productivity than with the conventional reclamation plan. Planted pine acreage would increase to 431 acres with the sand/clay mix plan. More acreage (2,120 acres) would be planted as forest than with the conventional plan (1,930 acres). Freshwater swamp and marsh acreage would remain essentially as it is.

Overburden/Clay Mix Plan: In this plan, 10,421 acres would be designated for agricultural use. The 7,670 acres of 2:1 sand/clay mix would be tillable and more productive than the 6,168 acres of clay associated with the conventional plan. Other land use acreages would be similar to those for the sand/clay mix plan.

3.7.2.2.5 Transportation

Highway and road traffic would be increased as a result of construction and operation of the South Fort Meade Mine. It is anticipated that most mine-related traffic would use Mt. Pisgah Road from Fort Meade to County Line Road to Manley Road to the plant site. County Line Road has an average daily traffic count (ADT) of 750. The traffic load on County Line Road is considered typical of traffic on paved routes in the project area and is, therefore, used as the basis for comparing premine traffic to the traffic during mining construction and operation. The following two assumptions have been made in estimating traffic volumes related to mine construction and operation: (1) 15 percent of the existing ADT occurs between 10:00 PM and 7:00 AM, the remainder being distributed evenly throughout the daytime hours; and (2) a carpooling factor of 1.7 persons per vehicle is applied to the labor force. Using these assumptions, the following peak traffic volumes and ADT's are estimated for Mt. Pisgah Road and County Line Road during Phase I and II construction and operation periods.

Period	Peak Traffic Volume (vehicles per hour)	ADT
Existing (based on 1975)	38	750
Phase I Construction (maximum period, 1983)	391	1,456
Phase I Operation (1984)	74	923
Phase II Construction (1985)	427	1,629
Phase II Operation (1986-2006)	94	1,025

The flow of mine-related traffic would be opposite to the travel of those residents who live near the mine and work in adjacent communities.

The peak traffic volume of 427 vehicles per hour would occur in 1985 when Phase I operation and Phase II construction activities overlap. The maximum service volumes for a two lane paved road similar to Mt. Pisgah Road and County Line Road is estimated as 900 vehicles per hour. Therefore, the peak project induced traffic on the local roads is still less than half the maximum service volume. The peak traffic volume would occur during 1985 and would drop off for the remainder of the mine life. Construction related equipment would also be transported on the local roadway system from 1982 through 1986, possibly creating some local short-term traffic congestion problems.

Transportation of the product is the second major transportation demand that could present a socioeconomic impact. The proposed action (railroad) and alternative method (truck transport) are discussed below.

Railroad (Proposed Action): The proposed construction of a rail spur from the existing Seaboard Coast Line tract west of the mine to the beneficiation plant would be along a 100-foot wide approximately six-mile long corridor acquired by Mobil. There would be one grade crossing on Mt. Pisgah Road which would be crossed four times each day. During Phase I operations, the trains would consist of one locomotive and 33 cars. During Phase II operations, the same number of train trips would be required but each train would have 65 cars. Each train crossing would block traffic on Mt. Pisgah Road for approximately six minutes. The right-of-way for the spur would traverse woodland areas and improved pasture.

Truck: During Phase I operations, 45 trucks would have to make 260 round trips per day in order to move the product from the mine to Nichols. Twice as many round trips would be required to implement Phase II operations. During Phase I operations, more than 100 additional personnel would be required to drive the trucks and service them. During Phase II operations, the personnel requirement would double. The movement of these trucks would increase the maintenance requirements for area roadways due to the increased vehicle weight and traffic volumes.

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4.0 SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY

The proposed mining and processing of phosphate matrix from the South Fort Meade Mine involves the progressive use of 15,200 acres of the site during an expected 25-year mine life. Approximately seven percent of the 16,300-acre site would be left in its present state. The site's productivity currently includes range and pasture, wildlife and water. The following discussion of short-term use versus long-term productivity is arranged by environmental discipline groups.

4.1. METEOROLOGY, AIR QUALITY AND NOISE

4.1.1. SHORT-TERM

As a result of the plant construction, mining, beneficiation and transshipment of phosphate rock, emissions of gases and particulates would be increased. Emission sources would include the beneficiation plant (e.g., flotation reagents), internal combustion engines (e.g., earthmovers), land clearing operations (e.g., wind-blown dust) and dust particles from increased vehicle traffic, mining and processing operations. Noise levels would increase in the immediate vicinity of active land clearing, mining and reclamation operations, near the beneficiation plant, and near the railroad spur and roadway systems into the plant. At times, these emissions and noise levels may disturb nearby wildlife and disrupt existing wildlife usage patterns.

4.1.2 LONG-TERM

Since mining and processing will continue for 25 years and reclamation activities an additional 10 years thereafter, the short-term effects generated by these activities may also be viewed as long term. At the conclusion of the mining and reclamation operations, project generated emissions and noise would cease.

4.2 GEOLOGY AND SOILS

4.2.1 SHORT-TERM

Soils and surface geology will be totally disrupted over the 15,194 acres. Agricultural productivity in the short term will be increasingly diminished over the life of the mine until reclamation activities "catch up" and overtake acreages under mining. The disturbed lands utilized as waste disposal areas would not have structural properties compatible with the construction of buildings.

4.2.2 LONG-TERM

The reclaimed clay settling areas would have certain improved agronomic properties compared to the existing soils characteristic to the site. The high nutrient availability and enhanced moisture and nutrient retention capacity of the reclaimed clay soils would improve the agricultural productivity of the site. The poor structural stability of the reclaimed clay settling areas would preclude building over the long term.

4.3 RADIATION

4.3.1 SHORT-TERM

Increased levels of radioactivity would result during mining. These short-term exposure levels would not present significant problems to the workers or the environment.

4.3.2 LONG-TERM

Radon gas emissions from the reclaimed waste settling areas would continue at low concentrations for a significant time into the future. Restrictions would be required on structures built on reclaimed clay settling areas to prevent the build up of radon gas.

4.4 GROUNDWATER

4.4.1 SHORT-TERM

Groundwater withdrawal for matrix processing would create a cone of depression in the Lower Floridan Aquifer. The calculated drawdown in the piezometric surface at the property boundaries would range from a maximum of 4.3 feet to less than one foot. Withdrawals and pit seepage of water from the Surficial Aquifer would slightly reduce the baseflow contributions to adjacent streams.

4.4.2 LONG-TERM

The placement of clay basins over 9,683 acres of the site would reduce groundwater recharge to the Surficial Aquifer. The weighted average recharge for the total site would be reduced by approximately 46 percent.

4.5 SURFACE WATER

4.5.1 SHORT-TERM

Mining and waste disposal operations at the South Fort Meade site would result in the disturbance of tributaries to Bowlegs Creek and the Peace River. Floodplains and low flow values of the Peace River downstream of the site would be slightly altered (less than four percent). Organic loads from on-site tributaries to Bowlegs Creek and the Peace River would be decreased by less than two percent.

Discharges of excess water from the recirculation water system would contribute mass loadings of TSS, total phosphorus, fluorides and other minor constituents to the Peace River. Water quality is not expected to change significantly as a result of these discharges.

4.5.2 LONG-TERM

Some minor alterations of surface runoff quantities and peak flows would be observed after reclamation. The clay content of the reclaimed soils in clay settling areas would cause increases in the total runoff quantities and peak flows expected after precipitation. Additional areas with agricultural vegetation would also increase peak runoff flows. The marsh areas and shallow pools would provide water storage.

After reclamation, water quality of the streams would be primarily influenced by pollutants carried in the runoff. The site would be reclaimed to agricultural and silvicultural uses, similar to present land use. Small marsh areas established in the above-grade reclaimed areas and two large wetland areas (totaling 1,513 acres) would accumulate surface runoff from surrounding upland areas, trap much of the sediment, and filter much of the excess nutrients. As the reclaimed streams mature, the channels would form natural meanders. The water quality found within the mature reclaimed streams should be similar to that presently found in the streams.

4.6 BIOLOGY

4.6.1 SHORT-TERM

Development of the South Fort Meade Mine would result in the destruction of 15,194 acres of terrestrial and aquatic habitat. Some aquatic and terrestrial species would be lost if they do not migrate to unaffected areas as mining gradually progresses. Some individuals of sensitive species, such as the indigo snake and alligator, would be lost but the regional populations should not be affected (see Section 7.3, Coordination). Preserved areas such as Bowlegs Creek, the Peace River, and the cypress dome would aid in re-establishing populations after mining and reclamation activities are complete.

4.6.2 LONG-TERM

Approximately 75 percent of the existing site is currently used for cattle grazing, including pasture, flatwoods, and bayheads. Reclamation plans propose the use of a majority (71 percent) of the site as improved pasture, which represents a 67 percent increase in improved pasture on the reclaimed site. Such areas would not provide all of the habitat requirements for the species which now inhabit the site; thus, a long-term loss in the wildlife productivity of these areas would occur. Additional changes in habitat, such as replacing upland hardwood forest with upland mixed forest and freshwater swamp with freshwater marsh and forested stream channels, would occur. The reclaimed vegetative cover would take an extended time (over 30 years) to allow invasion of other plant species which would eventually restore the diversity of the habitat to the site.

4.7 HUMAN RESOURCES

4.7.1 SHORT-TERM

The South Fort Meade Mine project would provide continued jobs for the 175 personnel now employed at Mobil's Fort Meade Mine plus an additional 58 new jobs, increasing employment in Polk County and the central Florida area. Construction and new operation labor requirements for the project would primarily come from the local area. Tax revenues generated by the mine would more than pay for community service requirements of the Mobil employees.

Mining would destroy any historical site which might be present on the South Fort Meade site. However, no significant archaeological sites have been identified on the property (see Section 7.4, Consultation with the State Historic Preservation Officer).

4.7.2 LONG-TERM

Development of the proposed mine would sustain Mobil's economic contribution to the long-term economic growth within Polk County. The proposed South Fort Meade Mine would replace the existing Fort Meade Mine as a source of employment and tax revenue generation, upon which Polk County is dependent. The increased agricultural land and improved productivity should allow for growth of the agricultural sector of the area's economy.

5.0 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section presents a discussion of those resources which would be consumed, depleted, permanently removed, destroyed or irreversibly altered by the proposed mining operation on the Mobil site.

5.1 DEPLETION OF MINERAL RESOURCES

The extent of recoverable U.S. phosphate reserve has been estimated at 2.2 billion metric tons (U.S. General Accounting Office, 1979). World reserves of phosphate rock are estimated by the U.S. Bureau of Mines to be about 27 billion metric tons, but may be much larger (e.g., in 1971 the British Sulphur Corp. estimated world reserves of all grades to be 130 billion metric tons). The estimated current world phosphate rock production is about 120 million metric tons. The U.S., USSR, and Morocco are by far the largest producers of rock, accounting for 41, 26, and 15 percent of world production, respectively. Morocco, however, is the leader in identified reserves with 66.7 percent of the world's supply, with the U.S. and USSR accounting for only 8.1 and 3.3 percent of the identified reserves, respectively.

The Bone Valley formation of central Florida is the source of most of the U.S. production, accounting for about 75 percent of total production (which approached 50 million metric tons in 1978).

Two projections of U.S. phosphate rock production have been made--one by the U.S. Bureau of Mines and one by Chase Econometric Associates (U.S. General Accounting Office, 1979). The Chase forecast indicates that domestic production will increase to 112 million short tons by 2025, but fails to identify the source of these reserves. The U.S. Bureau of Mines, on the other hand, predicts that U.S. production will peak in 1985, and then decline. Because the U.S. Bureau of Mines has not identified any future potential reserves, their forecast predicts that high grade reserves will be virtually exhausted by 2010.

The U.S. General Accounting Office (1979) has recommended:

> "...that the Secretary of the Interior make a thorough review of the Nation's long-range phosphate position, and report to the Congress on its future availability, and if appropriate, to suggest legislative actions needed to ensure supply. Such a review should be submitted to the Congress by December 1981 and include the following:
>
> 1. A comprehensive assessment of the phosphate reserves of the nation and the world. To the extent that this is based on unverified data, the Secretary should judge the reliability of such data and the need, if any, for Government verification of proprietary (source) records.
> 2. A determination of the extent to which noneconomic trade-offs, such as environmental needs and other land-use needs, are likely to limit future phosphate development.
> 3. A review and evaluation of alternatives to import dependency and assessment of their costs.
> 4. A submission from the Department of Agriculture contributing to the comprehensive phosphate assessment by estimating future needs and possible food production alternatives to being dependent on foreign fertilizer sources."

In March of 1980, then Secretary of the Interior Cecil D. Andrus responded to the above recommendations. In his letter (Andrus, 1980) he stated that the Department of Interior's most recent projections were consistent with the statements in the U.S. General Accounting Office Report, stating "that the United States will continue to be a net exporter of phosphate until at least the year 2000". Since there is no projected shortage of domestic phosphate, Andrus requested an extension (to December 1982) for the completion of the report to the Congress.

From the U.S. Bureau of Mines projections, total cumulative U.S. phosphate production over the next 20 years should be on the order of 1.2 billion tons. Over the 25-year life of Mobil's proposed mining operation, a total of approximately 77 million tons of phosphate rock would be removed. From 1984 to 1986 the production rate would be 1.7 million tons per year. When Phase II begins in 1987, the production would increase to 3.4 million tons per year, or about 5.6 percent of the annual U.S. production. While this represents an irreversible and irretrievable loss of reserves, data are not available to evaluate this loss with respect to future domestic needs and availability.

5.2 LANDFORM CHANGES

The mining/processing of phosphate on the Mobil site would result in an irreversibly altered landform. Natural soil profiles will be destroyed and existing vegetation cleared. In addition, storage of waste clays will result in the creation of 8,170 acres of diked disposal areas with an average height of 39 feet. The land use of the reclaimed site will primarily be for improved pasture and mixed forests, rather than the pine flatwoods and hardwood forests which now predominate.

5.3 CHEMICALS AND REAGENTS

The total expected quantities of reagents to be consumed at the proposed South Fort Meade Mine are listed below. Chemical reagents used in the flotation process would not be recoverable.

Reagent	Usage Rate (gal/ton of phosphate)	Total Usage Over Mine Life (millons of gallons)
No. 5 Fuel oil	0.45	34.1
Kerosene	0.05	3.6
Caustic	0.02	1.5
Fatty Acid	0.29	21.6
Amine	0.06	4.3
Sulfuric Acid	0.03	24.5

5.4 WATER

A maximum of 16.4 mgd of water may be pumped from the groundwater under the authorization of the SWFWMD CUP. Mobil plans to obtain 0.7 mgd from the Upper Floridan Aquifer and the balance (15.7 mgd) from the Lower Floridan Aquifer. The total volume of water withdrawn from the Floridan Aquifer over the 26-year life of the mine plus the initial (18-month) reservoir filling period would be 165 billion gallons. The disposition of this water is expected to be as follows:

	Rate (mgd)	Total over the Mine Life (gal x 10^9)
Water contained in phosphate rock leaving the site	0.33	2.9
Seepage from ponds on the site	2.7	21.8
Water in waste clay and sand tailings on the site	13.3	107.0

5.5 ENERGY

Energy usage for all purposes is expected to be 247,000 MWh per year in Phase I and 372,300 MWh during Phase II. The total energy use over the life of the project will be about 8,200,000 MWh or about 110 kWh per ton of phosphate rock produced.

5.6 FISH AND WILDLIFE HABITAT

Existing fish and wildlife habitats on 15,194 acres of the 16,288 acres comprising the proposed South Fort Meade Mine would be disturbed during the operation of the mine. The disturbed habitats would be removed during mining and replaced during reclamation. Some interim mine ponds and spoil areas would naturally revegetate and provide interim habitat. The changes in wildlife habitat acreage are identified in the following chart.

and replaced during reclamation. Some interim mine ponds and spoil areas would naturally revegetate and provide interim habitat. The changes in wildlife habitat acreage are identified in the following chart.

	Existing (acres)	Undisturbed (acres)	Reclaimed (acres)	Post Mining (acres)	Change (acres)
Agricultural	8,282	108	11,413	11,521	+3239
Cutover Flatwoods and Bayhead	3,452	182	0	182	-3270
Upland Hardwood Forest	1,804	664	0	664	-1140
Upland Mixed Forest	126	5	1,271	1,276	+1150
Planted Pine	339	0	453	453	+ 114
Water Areas	13	3	0	3	- 9
Forested Stream Channel	0	0	277	277	+ 277
Freshwater Swamp	1,014	111	478	589	- 426
Freshwater Marsh	1,040	21	1,302	1,323	+ 283
Developed	218	0	0	0	- 218
TOTAL	16,288	1,094	15,194	16,288	0

As indicated in the chart, 3,239 additional acres would be committed to agricultural use after reclamation is completed. This is roughly equivalent to the 3,270-acre loss of cutover flatwoods and bayhead habitat. Approximately 80 to 90 percent of the cutover flatwoods would also be used for grazing by cattle and would have marginal value as wildlife habitat. The 1,140-acre loss of upland hardwood forest would be offset with 1,150 acres of upland mixed forest planted with nursery stock. The existing 339 acres of planted pine would be harvested for pulpwood and reclamation would replace them with 453 acres of planted pine. Wetland habitat would be reproportioned, with an additional 277 acres of forested stream channel and 283 acres of additional freshwater marsh. Freshwater swamp habitat would be reduced by 426 acres after mining and reclamation are complete.

Some individuals of threatened species, such as the indigo snake and the American alligator, would be lost (estimated loss in the range of 10 each).

5.7 HISTORICAL AND ARCHAEOLOGICAL RESOURCES

As discussed in Section 3.7 (Human Resources) there is no evidence of the presence of significant archaeological artifacts or major historical sites on the proposed mine site. Excavation of overburden and ore from the site could destroy previously unfound artifacts unless their presence is noticed during the mining process and excavation is undertaken.

5.8 REFERENCES

Andrus, C.D. 1980. Letter from Secretary of Interior Cecil D. Andrus to Representive Jack Brooks, Chairman of the Committee on Government Operations, March 27, 1980.

U.S. General Accounting Office. 1979. Phosphates: A Case Study of a Valuable, Depleting Mineral in America. Report by the Comptroller General to the Congress, EMD-80-21.

6.0 COMPARISON OF PROPOSED ACTIVITY WITH AREAWIDE EIS RECOMMENDATIONS

The Final Areawide Environmental Impact Statement for the Central Florida Phosphate Industry published by EPA in November, 1978, evaluated the impact of various alternatives for phosphate mining in central Florida. The EPA recommendations represent a scenario of phosphate development determined to be as compatible as practicable with other desired and intended land uses. These recommendations provide a decision-making tool for consideration for all new phosphate mines in central Florida. The following discussion compares Mobil's proposed action with the Areawide EIS recommendations for mining and beneficiation. In addition, where EPA's proposed action and recommended alternatives differ from Mobil's proposed action (as in the case of waste disposal), EPA's proposal is also compared to the Areawide EIS recommendations.

6.1 MINING AND BENEFICIATION REQUIREMENTS

6.1.1 ELIMINATE THE ROCK-DRYING PROCESSING AT BENEFICIATION PLANTS AND TRANSPORT WET ROCK TO CHEMICAL PLANTS

Mobil's proposed project does not include a rock dryer and calls for all wet rock to be transported from the site in a wet condition.

6.1.2 MEET STATE OF FLORIDA AND LOCAL EFFLUENT LIMITATIONS FOR ANY DISCHARGES

Pursuant to Section 401 of the Federal Water Pollution Control Act as amended (33 USC 1251), the State of Florida issues certification to each applicant for a National Pollutant Discharge Elimination System (NPDES) permit. All recent NPDES permits issued by the state for phosphate mining facilities have been certified subject to the following conditions:

- The applicant must comply with all applicable requirements of Chapter 403, Florida Statutes, and Chapter 17 series, Florida Administrative Code (FAC).

- Issuance of certification does not constitute state certification of any future land alteration activities which require other Federal permits pursuant to Section 404 of P.L. 92-500, as amended, nor does it constitute approval or disapproval of any future land alteration activities conducted in waters of the state which require separate department permit(s) pursuant to Section 17-4.28, FAC.

- In accordance with Section 17-6.01(2)(a)2a.D., FAC, the following effluent limitations apply to all discharges designated as possibly containing contaminated runoff, process generated wastewater, or mine dewatering discharges from the mining and beneficiation of phosphate rock.

Characteristics		Discharge Limitations 1-Day Max.	Discharge Limitations 30-Day Avg.	Monitoring Requirements (Once per week)
Total Suspended Solids	(mg/l)	25	12	1/wk/24-hour composite
Total Phosphorus	(mg/l)	5	3	1/wk/24-hour composite
pH		6.0-9.0	6.0-9.0	grab sample

If the above requirements are met, the discharge from this facility will comply with Sections 301, 302 and 303 of the Federal Water Pollution Control Act, as amended.

This certification must indicate that the terms and conditions of the NPDES permit will result in compliance with Sections 301, 302 and 303 of the Federal Water Pollution Control Act, as amended. The state may impose, as additional requirements, applicable state law or regulations related to water quality standards.

6.1.3 ELIMINATE CONVENTIONAL ABOVE-GROUND SLIME-DISPOSAL AREAS

The elimination of conventional above-ground clay disposal areas is recommended by the Areawide EIS. In order to meet this recommendation, the Areawide EIS encouraged the use of waste clays, or a mixture of sand tailings and waste clays, in reclamation. At the same time, the need for an initial above-ground storage area and for retaining dikes around sand/clay mix areas was recognized. The Areawide EIS also noted that if the percentage of waste clay at a mine exceeds the proportionate amount that can be utilized, the incremental amounts beyond that which can be handled by new clay dewatering methods may be placed in a holding pond for reclamation after adequate settling (i.e., conventional settling).

The proportionate amount of clay at the Mobil mine site is high relative to other mines in the region (Table 2.5-1). The proportion of clay, commonly expressed as a sand to clay ratio, is only 1.2:1 at the Mobil site. This sand to clay ratio at the site is insufficient to allow for complete sand/clay mix waste disposal. Therefore, Mobil proposes to use a modification of the conventional above-ground waste disposal method. The modification consists of stage-filling the clay disposal areas (9,683 acres) to obtain increased settling, followed by capping 15 percent (1,489 acres) of the clay settling areas with sand tailings. Following reclamation, 6,681 acres of above-grade, uncapped clay settling areas would remain as the predominant landform. The average dike height for this waste disposal plan is 38.7 feet above natural grade. From 385 acres to a maximum 2,790 acres of clay settling areas would be active at a given time during the life of the mine. EPA's preferred action, however, is the use of the sand/clay cap waste disposal alternative. Sand/clay cap clay settling areas are not considered "conventional". After the settling basins are initially filled with clay, they are actively dewatered to form a surface crust and then a second stage fill of sand/clay mix (4:1) is added to cap the area. The sand/clay cap would average five feet thick over the area. The sand/clay cap waste disposal plan would have 7,580 acres of above-grade sand/clay cap areas and no above-grade clay settling areas. The settling areas, active at one time, would range from 590 acres to 1,860 acres during the life of the mine.

6.1.4 MEET SOUTHWEST FLORIDA CONSUMPTIVE USE PERMIT REQUIREMENTS

The Areawide EIS recommends that any new source mine and beneficiation plant meet Southwest Florida Water Management District's (SWFWMD) Consumptive Use Permit (CUP) requirements. Mobil is obligated to the terms and conditions of their SWFWMD CUP No. 205403 issued on October 7, 1980. Should Mobil fail to comply with all of the conditions set forth in the permit, the permit will automatically become void.

6.1.5 PROVIDE STORAGE THAT ALLOWS RECIRCULATION OF WATER RECOVERED FROM SLIMES

The Areawide EIS recommends that a new source mine provide storage that allows recirculation of water recovered from clays. The water recirculation system for Mobil's proposed mining and beneficiation facility would provide for containment and for approximately 90 percent water recirculation so that a discharge should occur only occasionally during heavy rainfall periods.

6.1.6 USE CONNECTOR WELLS

The Areawide EIS recommends the use of connector wells. At the South Fort Meade site the transmissivity of the Surficial Aquifer is rather low (11 to 439 gpd/ft), and the gross alpha radiation levels were found to be high (0.4 to 77 pCi/l). Therefore, Mobil does not propose to use connector wells to recharge the Floridan Aquifer with groundwater from the Surficial Aquifer, nor is the use of connector wells a condition of Mobil's SWFWMD CUP.

6.1.7 ADDRESS PROPOSED REGULATIONS REGARDING RADIATION LEVELS TO BE PUBLISHED BY EPA AND PROJECTED BY MINING AND RECLAMATION PLANS FOR NEW SOURCE MINES BASED ON TEST BORINGS OF MATERIAL TO BE ENCOUNTERED, AND DEVELOP A RECLAMATION PLAN THAT CONSIDERS RADIATION OF SPOIL MATERIAL AND REDUCES AS MUCH AS POSSIBLE THE AMOUNT OF RADIONUCLIDE-BEARING MATERIAL LEFT WITHIN 3-4 FEET OF THE SURFACE

Mobil proposes to practice leach zone management by pocket toe spoiling techniques during mining. This would significantly minimize the impact of redistributing naturally occuring radionuclides during the mining operation and would reduce surface radiation levels on reclaimed landforms. Even with leach zone management, redistribution of radioactive materials (sand and clay from the matrix) will occur. Surface soil radium-226 levels for reclaimed lands are expected to range from 1 pCi/g for the 477 acres of overburden fill areas to 22 pCi/g for the 6,681 acres of above-grade clay settling areas and 1,513 acres of below-grade clay settling areas. Estimated radium-226 concentrations for the 5,034 acres of sand tailings capped with overburden and 1,489 acres of above-grade clay capped with sand tailings are 3 pCi/g. With the EPA preferred alternative (sand/clay cap waste disposal and reclamation plan), soil radium-226 concentrations are expected to range from 1 pCi/g for the 432 acres of overburden fill to 22 pCi/g for the 1,513 acres of below-grade clay settling areas. A total of 5,079 acres of sand tailings capped with overburden would have an estimated soil radium-226 concentration of 3 pCi/g. The major difference between this alternative and the conventional plan is that the large area of clay capped with a sand/clay mix (7,580 acres) would have an estimated soil radium-226 concentration of 10 pCi/g, whereas the conventional plan had 6,681 acres of above-grade clay settling areas at 22 pCi/g.

Should buildings (such as residences) be located on the reclaimed site, indoor radon and radon progeny concentrations would be higher in these structures than outdoors. For any homes that are constructed on reclaimed land with Mobil's proposed conventional waste disposal and reclamation plan, the predicted indoor radon progeny could range from 0.0082 WL over reclaimed sand tailings areas capped with overburden (5,034 acres) to 0.0172 WL over reclaimed clay settling areas (6,681 acres). The value for homes over clay settling areas capped with sand tailings (1,489 acres) would be 0.0121 WL. With the EPA preferred alternative, the sand/clay cap waste disposal/reclamation plan, the predicted indoor radon progeny would be 0.0082 WL over reclaimed sand tailings capped with overburden (5,079 acres), 0.0158 WL over reclaimed clay settling areas capped with overburden (590 acres), and 0.0126 WL over reclaimed clay setting areas capped with sand/clay mix (7,580 acres). The net effect of the sand/clay cap plan versus the conventional plan on indoor radon progeny concentrations would be a reduction from 0.0172 WL to 0.0126 WL on approximately 6,000 acres of land.

Specific guidance was provided by EPA (1979) for new homes on any reclaimed land, debris-covered areas, and unmined lands containing phosphate resources:

> "IV. Development sites for new residences should be selected and prepared, and the residences so designed and sited, that the annual average indoor ...'Working Levels'... do not exceed... background levels."

If the final guidance for reclaimed lands is similar to the recommendation quoted above, then the upper limit of predicted WL's in slab-on-grade homes will be approximately 0.009 WL (normal background of 0.004 WL plus the uncertainty of 0.005 WL). Under either reclamation plan (Mobil's proposal or EPA's preferred plan) a large portion of the reclaimed Mobil site would exceed this upper range. Residential development of the reclaimed site is not planned or anticipated. If residences were planned they could not be slab-on-grade; they would have to be designed to prevent the accumulation of radon progeny concentrations above the 0.009 WL limit.

6.1.8 MEET COUNTY AND STATE RECLAMATION REQUIREMENTS AND INCLUDE AN INVENTORY OF TYPES OF WILDLIFE HABITAT IN THE AREA TO BE MINED AND THE AREA IMMEDIATELY SURROUNDING IT

Mobil's proposed South Fort Meade Mine is defined in Section 380.06, Florida Statutes, as a Development of Regional Impact (DRI). In accordance with state regulations for DRI's, on May 11, 1981, Mobil submitted an application for Development Approval to Polk County and the State of Florida. Mobil's proposed project as contained in the DRI document and Application meets all the State of Florida Department of Natural Resources requirements for reclamation (Chapter 16C-16, Florida Administrative Code). Therefore, if and when Mobil receives an approved Development Order from Polk County, its mining and reclamation plan will meet all reclamation requirements of the State of Florida as well as the county.

An inventory of the types of wildlife habitat in the area to be mined by Mobil and in the immediate surrounding area was made and is included in the EIS.

6.1.9 THE MINING AND RECLAMATION PLAN WILL TAKE INTO ACCOUNT THE PROTECTION AND RESTORATION OF HABITAT SO SELECTED SPECIES OF WILDLIFE WILL BE ADEQUATELY PROTECTED DURING MINING AND RECLAMATION

Mobil's mining plan calls for 50-acre parcels to be cleared ahead of each dragline. Approximately 15,194 acres would be altered and reclaimed during the life of the proposed South Fort Meade Mine. Mobil's proposed reclamation plan would restore the 15,194 acres to various land use and cover categories, including 60,000 linear feet of stream channels. The net effect of Mobil's proposed action and EPA's preferred alternative on the extent of the general vegetation associations which currently exist on the site would be as shown on Tables 6.1-1 and 6.1-2.

Both Mobil's and EPA's preferred waste disposal/reclamation plans would greatly increase the acreage on the mine site devoted to improved pasture. However, the acreage occupied by upland mixed forest, planted pine and freshwater marsh would also increase. Transitional wetland species would be planted in the floodplain of the reclaimed streams. Only native species would be used in the reclamation plantings.

Among the species that would be adversely affected by the project is the eastern indigo snake listed as a threatened species by the U.S. Fish and Wildlife Service (USF&WS). In order to assess the impact which the project will have on this species' population, consultation procedures were implemented with the USF&WS (see Section 7.0 Coordination). Consultation also revealed the presence of an eagle nest adjacent to the Mobil site and potentially subject to disturbance by the proposed mining activities. The USF&WS provided EPA with a Biological Opinion regarding the effects of the project on endangered and threatened species, stating that the proposed project is not likely to jeopardize the continued existence of any listed species or adversely modify habitat essential for their existence. Mitigating measures recommended by USF&WS have been incorporated as conditions to the NPDES permit.

6.1.10 PROTECT OR RESTORE WETLANDS UNDER THE JURISDICTION OF THE CORPS OF ENGINEERS, SECTION 404, FEDERAL WATER POLLUTION CONTROL ACT, PURSUANT TO 404(b) GUIDELINES (40 CFR 230)

Federal jurisdiction over wetlands is based primarily on Section 404 of the Clean Water Act of 1977 (33 USC, 1344), formerly known as the Federal Water Pollution Control Act, in which wetlands are defined, their uses and values described and a basis for regulation presented. Subsequently, vegetation lists were developed to assist in defining wetlands (U.S. Army Corps of Engineers, 1978), and a functional and physical approach to wetland classification has been developed (Cowardan et al., 1977). Reppert et al. (1979) provide a technical concept and procedure for evaluation of wetlands based on the

TABLE 6.1-1

EFFECT OF MOBIL'S PROPOSED RECLAMATION PLAN

Vegetation Association	Current Acreage	Disturbed Acreage	Preserved Acreage	Reclaimed Acreage	Post-Reclamation Acreage	Acreage Current: Post Reclamation
Improved Pasture	7716	7608	108	11,413	11,521	+3805 (+49%)
Cutover Flatwoods	3452	3270	182	0	182	-3270 (-95%)
Upland Hardwood Forest	1804	1140	664	0	664	-1140 (-63%)
Upland Mixed Forest	126	121	5	1271	1276	+1150 (+913%)
Planted Pine	339	339	0	453	453	+114 (+34%)
Water Areas	13	10	3	0	3	-10 (-77%)
Forested Stream Channel	-	-	0	277	277	+277
Freshwater Swamp	1014	903	111	478	589	-425 (-42%)
Freshwater Marsh	1040	1019	21	1302	1323	+283 (+27%)
Developed	218	218	0	0	0	-218 (-100%)
Citrus	566	566	0	0	0	-566 (-100%)
	16,288	15,194	1094	15,194	16,288	

TABLE 6.1-2

EFFECT OF EPA'S PREFERRED ALTERNATIVE RECLAMATION PLAN

Vegetation Association	Current Acreage	Disturbed Acreage	Preserved Acreage	Reclaimed Acreage	Post-Reclamation Acreage	Acreage Current: Post Reclamation
Improved Pasture	7716	7608	108	11,003	11,111	+3395 (+44%)
Cutover Flatwoods	3452	3270	182	0	182	-3270 (-95%)
Upland Hardwood Forest	1804	1140	664	0	664	-1140 (-63%)
Upland Mixed Forest	126	121	5	1451	1456	+1330 (+1056%)
Planted Pine	339	339	0	536	536	+224 (+58%)
Water Areas	13	10	3	0	3	-10 (-77%)
Forested Stream Channel	-	-	0	279	279	+279
Freshwater Swamp	1014	903	111	504	615	-399 (-39%)
Freshwater Marsh	1040	1019	21	1421	1442	+402 (+39%)
Developed	218	218	0	0	0	-218 (-100%)
Citrus	566	566	0	0	0	-566 (-100%)
	16,288	15,194	1094	15,194	16,288	

requirements of the Clean Water Act. The procedure emphasizes ecosystem functional criteria and structural characteristics rather than the presence of certain species as criteria. This provides a basin-wide assessment among widely varying wetland types and allows an evaluation of a particular site as a unit within a larger system.

In the Final Areawide Environmental Impact Statement for the Central Florida Phosphate Industry (EPA, 1978), the U.S. Environmental Protection Agency established a wetlands categorization system to serve as a guideline for regulating the mining and reclamation of wetlands. This system entailed the assigment of wetlands on new source mine sites into one of three categories:

Category 1: Preserve and Protect - Wetlands that must be preserved and protected without disruption. Wetlands within and contiguous to rivers and streams having an average annual flow exceeding 5 cubic feet per second as well as other specific wetlands determined to serve essential environmental functions, including water quality. (These are wetlands that provide an essential synergistic support to the ecosystem and that would have an unacceptable adverse impact if they were altered, modified, or destroyed.) This generally includes cypress swamps, swamp forests, wet prairies, and certain freshwater marshes.

Category 2: Mine and Restore Equivalent Acreage - Wetlands that should be restored as wetlands to perform useful wetland functions. This also includes certain isolated noncategory wetlands that serve a primary function or several minor functions that may be maintained through proper restoration.

Category 3: Mine With No Restoration of Wetlands - Wetlands that would not have to be restored as wetlands. These are isolated and normally intermittent in nature, have less significant hydrological functions than Category 2, and minimal life-support value.

The wetlands identified on the proposed South Fort Meade Mine Site have been defined and evaluated according to the requirements of Section 404 of the Clean Water Act and then categorized according to the guidelines presented in the Areawide EIS (EPA, 1978). The Reppert et al. (1979) procedure supplemented with a Delphi technique for weighting criteria was utilized to conduct a site-specific determination of wetlands and their functional significance on the proposed site. Site-specific conditions were used to assist in establishing the baseline from which the evaluation and categorization were made.

Mobil's proposed action and EPA's preferred alternative would result in the loss and protection of the following acreages of each of the wetland categories:

	Acres Existing	Acres Disturbed	Acres Protected	Percent Protected
Category 1	84	0	84	100
Category 2	1,601	1,553	48	3
Category 3	370	370	0	0
Total:	2,055	1,923	132	6

Approximately 1,923 acres designated as wetlands (94 percent of total wetland acreage) would be eliminated by mining. The preserved wetlands (132 acres) are primarily the large (75 acre) cypress dome on the eastern edge of the property and wetland areas within buffer strips along the Peace River (450 feet each side) and Bowlegs Creek (300 feet each side).

6.1.11 MAKE EFFORTS TO PRESERVE ARCHAEOLOGICAL OR HISTORICAL SITES THROUGH AVOIDANCE OR MITIGATE BY SALVAGE EXCAVATION PERFORMED BY A PROFESSIONALLY COMPETENT AGENCY ANY SITES DEEMED SIGNIFICANT BY THE FLORIDA DIVISION OF ARCHIVES, HISTORY, AND RECORDS MANAGEMENT. IF MITIGATION IS CHOSEN, THE RESULTING REPORT SHOULD BE SUBMITTED TO THAT STATE AGENCY FOR EXAMINATION AND COMMENT

An archaeological and historical survey of the Mobil site was conducted and the results were submitted to the Florida Division of Archives, History and Records Management. It was the opinion of this agency that the archaeological and historical resources on the site did not merit any further mitigative or preservation measures.

6.2 REFERENCES

Cowardin, L.M., V. Carter, F.C. Golef, and E.T. LaRue. 1977. Classification of Wetlands and Deepwater Habitats of the United States. Operational Draft, U.S. Fish and Wildlife Service.

Reppert, R.T., W. Sigleo, E. Stakhiv, L. Messman, and D. Meyers. 1979. Wetland Values: Concepts and Methods for Wetland Evaluation. IWR Research Report 79-R1. U.S. Army Engr. Inst. for Water. Res. Kingman Bld., Ft. Belvoir, Va.

U.S. Army Corps of Engineers. 1978. Preliminary Guide to Wetlands of Peninsular Florida. Major Associations and Communities Identified. Technical Report Y-28-2. Environmental Effects Lab., Vicksburg, Miss.

U.S. Environmental Protection Agency. 1978. Final Environmental Impact Statement for the Central Florida Phosphate industry. EPA 904/9-78-026a.

U.S. Environmental Protection Agency. 1979. Indoor Radiation Exposure due to Radium-226 in Florida Phosphate Lands. Office of Radiation Programs, Washington, D.C. EPA 520/4-78-013.

7.0 COORDINATION

7.1 DRAFT ENVIRONMENTAL IMPACT STATEMENT COORDINATION LIST

The following Federal. state and local agencies, public officials, organizations, and interest groups have been requested to comment on this impact statement.

Federal Agencies

Bureau of Outdoor Recreation
Bureau of Mines
Coast Guard
Corps of Engineers
Council on Environmental Quality
Department of Agriculture
Department of Commerce
Department of Education
Department of Interior
Department of Transportation
Department of Health and Human Services
Department of Housing and Urban Development
Department of Energy
Federal Highway Administration
Fish and Wildlife Service
Food and Drug Administration
Forest Service
Geological Survey
National Park Service
Economic Development Administration
Soil Conservation Service
Public Health Service

Members of Congress

Honorable Lawton Chiles
United States Senate
Honorable Sam Gibbons
U.S. House of Representatives
Honorable L.A. Bafalis
U.S. House of Representatives
Honorable Paula Hawkins
United States Senate
Honorable Andy P. Ireland
U.S. House of Representatives

State of Florida

Honorable D. Robert Graham
Governor
Coastal Coordinating Council
Department of Natural Resources
Department of Agriculture and Consumer Services
Department of Community Affairs
Geological Survey
Game and Freshwater Fish Commission
Department of Administration
Department of State
Environmental Regulation Committee
Department of Commerce
Department of Health and Rehabilitative Services
Bureau of Intergovernmental Relations
Department of Environmental Regulation
Department of Transportation

Local and Regional

Polk County Commission
Manatee County Commission
DeSoto County Commission
Hardee County Commission
Polk County Building & Zoning Department
Tampa Bay Regional Planning Council
Central Florida Regional Planning Council
Southwest Florida Water Management District

Interest Groups

The Fertilizer Institute
Florida Phosphate Council
Florida Audubon Society
Florida Sierra Club
Manasota 88
Florida Defenders of the Environment
Izaak Walton League of America
Florida Wildlife Federation

7.2 PUBLIC PARTICIPATION AND SCOPING

On October 16, 1979, EPA published in the Federal Register a Notice of Intent to prepare an EIS for the proposed project, and announced a public meeting for the purpose of defining the scope of the EIS and identifying the primary and secondary issues to be addressed in the Plan of Study for the EIS. The scoping meeting was held by EPA in Mulberry, Florida on November 28, 1979. The attendence of sixteen was largely comprised of members of the phosphate industry and representatives of consulting firms. Agencies represented were the Southwest Florida Water Management District (SWFWMD), the Florida Department of Transportation, the Florida Department of Agriculture, Division of Forestry, and the Polk County Building and Zoning Codes Department. Mr. John Heuer of SWFWMD briefly reviewed the SWFWMD procedures and emphasized that although groundwater withdrawals are under SWFWMD jurisdiction, groundwater consumption is a major issue with the phosphate industry and should be addressed in the EIS. Mr. D. Millard of the Forestry Service noted that projects were underway to determine the best tree species for reforesting reclaimed land. He indicated that the Forestry Service would prefer to see reclamation which encourages agricultural uses with an emphasis on forestry. These comments were considered in the preparation of the EIS.

7.3 CONSULTATION WITH THE U.S. DEPARTMENT OF INTERIOR

EPA has performed all consultation procedures in accordance with the requirements of Section 7 of the Endangered Species Act of 1973, as amended. On December 12, 1980, EPA provided the U.S. Department of Interior, Fish and Wildlife Service (USF&WS) with a description of the proposed Mobil project and requested that a list of endangered and/or threatened species which may occur in the project's area of influence be provided to EPA (EPA, 1980a). On December 18, 1980, the USF&WS commented that two endangered species, the bald eagle and the red-cockaded woodpecker, and two threatened species, the American alligator and the eastern indigo snake, may be present in the area (USF&WS, 1980).

On May 19, 1981, EPA provided USF&WS with a Biological Assessment of the impacts of the Mobil project on endangered or threatened species as required by Section 7 (c) of the Endangered Species Act (EPA, 1981a).

EPA indicated that after reviewing the Biological Assessment, it was EPA's determination that the proposed Federal action (i.e., issuance of an NPDES permit for the proposed project) might affect the threatened eastern indigo snake. Therefore, EPA officially requested that Section 7 consultation procedures be initiated. EPA also suggested in the May 19 letter that a capture and relocation program could be implemented to mitigate possible impacts on the species.

On May 29, 1981, EPA received information from USF&WS that a few individuals of an additional listed species, the endangered bald eagle, might be affected by the proposed project. An active eagle nest had been recently located on property adjacent to Mobil's proposed mine, approximately one-quarter mile from the mine boundary at the closest point (Figure 7.3-A). Both the USF&WS and the Florida Endangered Species Coordinator were concerned that the eagles' feeding area, believed to be on the adjacent Mobil property, be maintained. By correspondence dated June 5, and July 16, 1981, EPA suggested further mitigative measures for the protection of the eagles (EPA, 1981b and EPA, 1981c).

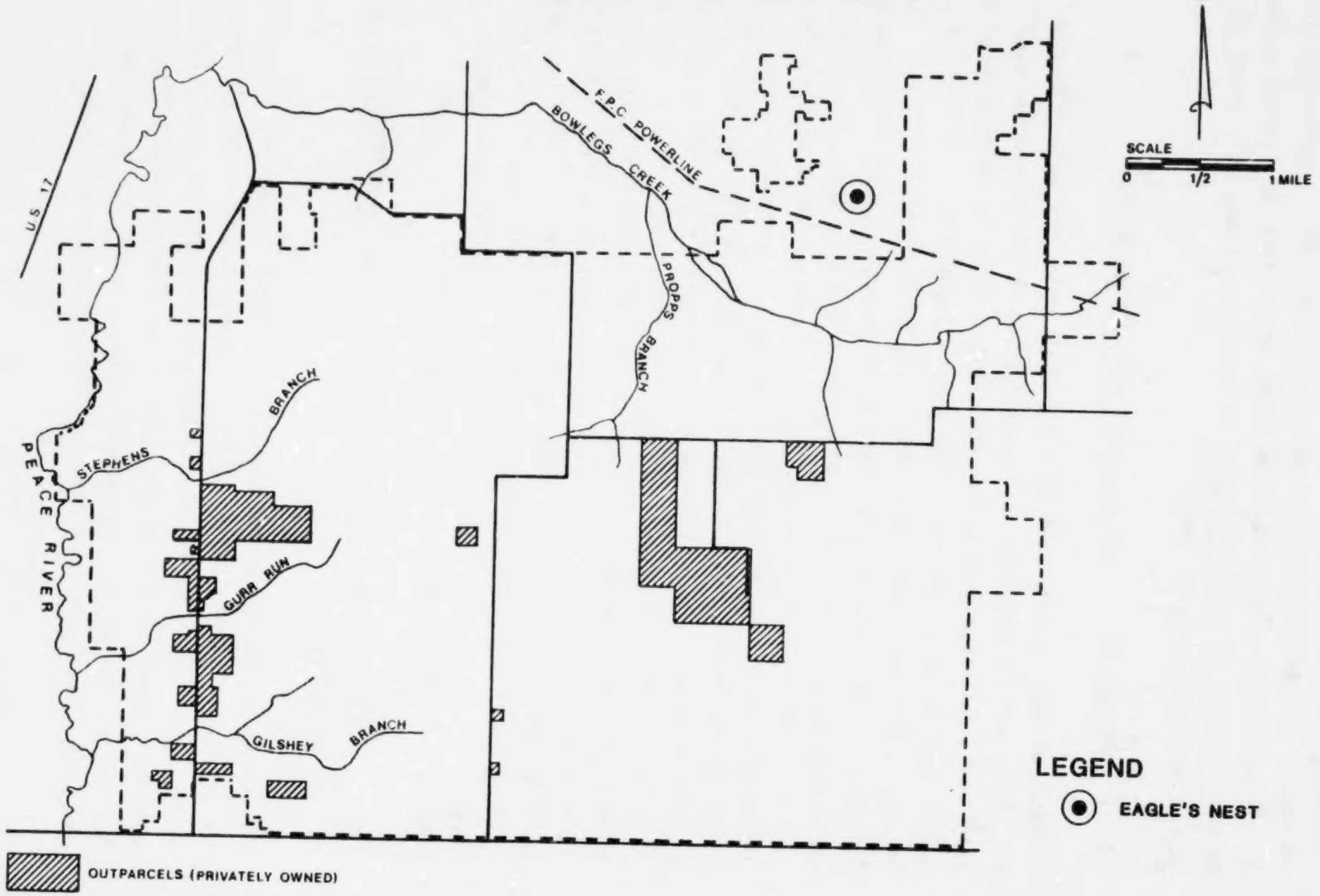
The USF&WS provided a Biological Opinion on the project to EPA on August 18, 1981 (USF&WS, 1981). The Biological Opinion stated that the proposed action is not likely to jeopardize the continued existence of the bald eagle, eastern indigo snake, red-cockaded woodpecker and American alligator. They did, however, make recommendations for preservation of the indigo snake and the bald eagle. These recommendations have been incorporated as conditions of the proposed NPDES permit.

7.4 CONSULTATION WITH THE STATE HISTORIC PRESERVATION OFFICER

EPA has carried out all consultation requirements established by Section 106 of the National Historic Preservation Act of 1966. On July 23, 1980, EPA provided the State Historic Preservation Officer (SHPO), Florida Department of State, Division of Archives, History and Records Management, with a description of the proposed Mobil project and a Cultural Resources Assessment of the South Fort Meade Mine site (EPA, 1980b) pursuant to the procedures for consultation and comment promulgated by the Advisory Council on Historic

FIGURE 7.3-A

LOCATION OF EAGLE'S NEST


N
SCALE
0
1/2
1 MILE
F.P.C. POWERLINE
BOWLEGS CREEK
PROPPS BRANCH
US 17
STEPHENS BRANCH
PEACE RIVER
GURR RUN
GILSHEY BRANCH
LEGEND
EAGLE'S NEST
OUTPARCELS (PRIVATELY OWNED)

SOURCE: FISH & WILDLIFE SERVICE

Preservation in 36CFR Part 800. On December 16, 1980, the SHPO replied to the EPA request by stating that it is unlikely that the Mobil project will affect any archaeological or historic sites listed or eligible for listing in the National Register of Historic Places, or otherwise of national, state, or local significance (Percy, 1980).

7.5 COORDINATION WITH THE U.S. ARMY CORPS OF ENGINEERS

Wetlands on Mobil's South Fort Meade site fall under the jurisdiction of the U.S. Army Corps of Engineers, and the execution of the proposed project in those areas will require a Section 404 (Federal Water Pollution Control Act) permit from the Corps. In view of the Corps' responsibility in this area, EPA has coordinated closely with them in the preparation of this EIS. On November 21, 1979, EPA, the Corps and Mobil executed a joint Memorandum of Understanding which established EPA as the lead agency and the Corps as a cooperating agency in preparing the EIS. The Corps was subsequently provided the opportunity for review and comment on the Plan of Study and on all work performed by the third party consultant including the Preliminary Draft EIS. In commenting to EPA on the Preliminary DEIS (Sanders, 1981), the Corps stated that although they continue to disagree with EPA's practice of categorization of wetlands, their review of the document revealed that sufficient factual information is presented to identify areas of importance comprising those wetlands subject to Department of Army Regulatory authority. The Corps advised that they will make their permit determination on the basis of the information provided in the DEIS, information obtained through their public review process, and requisites of their current regulations.

7.6 COORDINATION WITH THE U.S. DEPARTMENT OF INTERIOR, BUREAU OF LAND MANAGEMENT

The Bureau of Land Management (BLM) has retained, through patent reservations, the phosphates under approximately 8,000 acres in the central Florida phosphate area. These Federally owned reserves are scattered over a large area in moderately sized parcels which usually do not form contiguous blocks of land greater than 400 acres. They may be leased from the BLM in accordance with 43 CFR, Group 3500 (Leasing of Minerals Other than Oil and Gas).

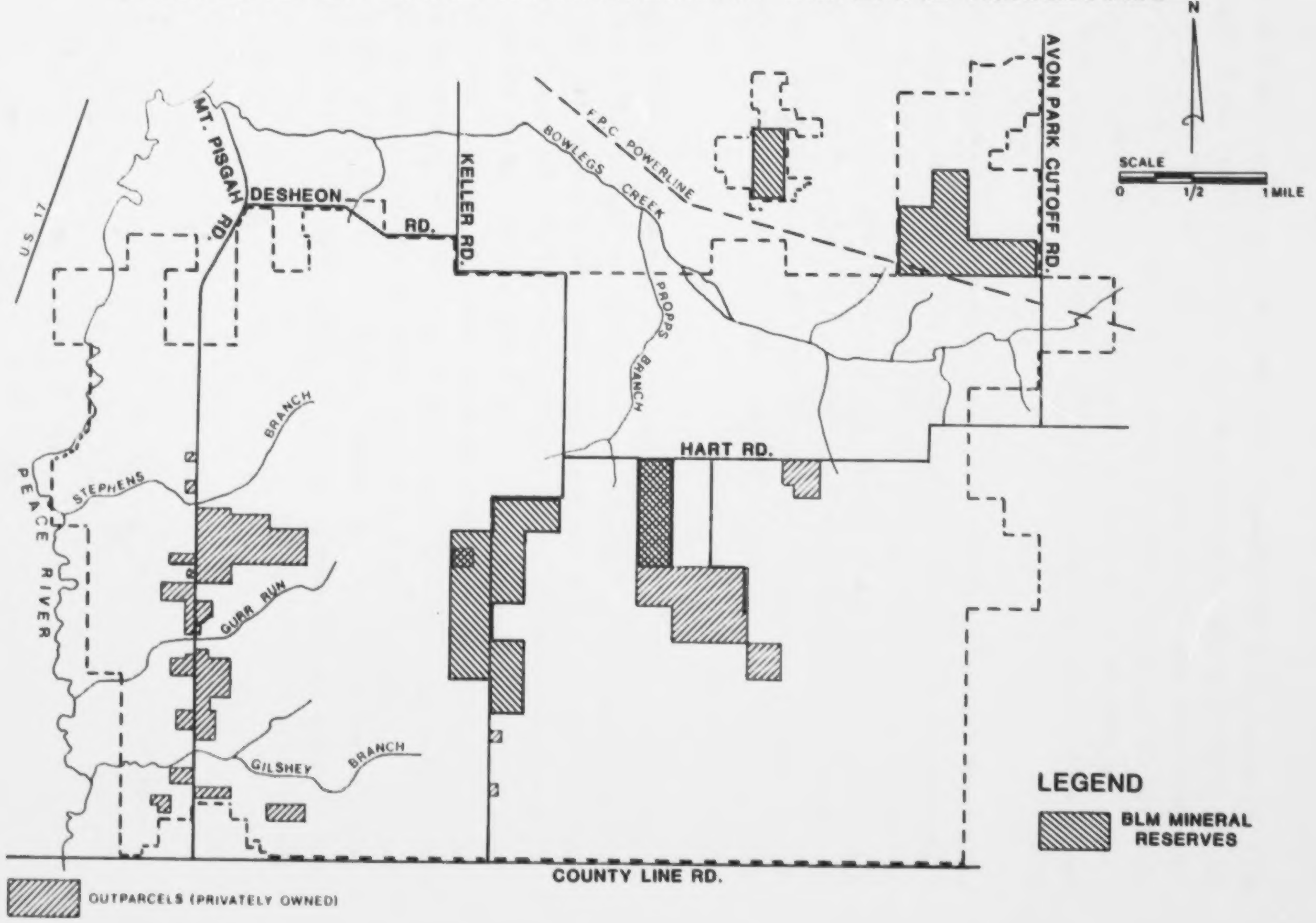
With the exception of the outparcels indicated, Mobil is the surface owner of all the property within the mine boundary as depicted on Figure 1.0-B, Page 1-3. Mobil also owns the phosphate under those same lands with the important exception of four parcels totalling approximately 880 acres as shown on Figure 7.6-A. The phosphate minerals under those 880 acres are BLM Mineral Reserves, and in order to mine them Mobil must obtain a competitive phosphate lease from BLM.

EPA was not informed by Mobil of their lack of phosphate mineral rights to any lands included in the South Fort Meade Mine site, and the scoping process carried out in October and November of 1979 failed to identify BLM's role in the proposed mine. On March 7, 1980, Mobil submitted four applications to BLM for competitive phosphate leases on a total of 1,445 acres of land in Polk and Hardee Counties, including the 880 acres within the South Fort Meade Mine site. This action was brought to EPA's attention by the BLM Eastern States Office on July 20, 1981 (BLM, 1981a).

By definition (40 CFR Sec. 1508.25) the proposed phosphate lease for those 880 acres would have been a "connected action" within the scope of EPA's environmental impact statement for the proposed mine. Therefore, on July 31, 1981, in accordance with 40 CFR Sec 1501 (1) (c), EPA requested BLM to participate as a cooperating agency with EPA as lead agency in preparing the EIS for Mobil's proposed South Fort Meade phosphate mine (EPA, 1981d). Specifically, EPA proposed that the EIS be used by BLM to meet their information needs for a decision on those lease lands contained within the boundary of the proposed mine addressed by the EIS. On August 28, 1980, the Eastern State Office of BLM confirmed the lead agency/cooperating agency relationship proposed by EPA for the Mobil EIS (BLM, 1981b).

FIGURE 7.6-A

BUREAU OF LAND MANAGEMENT MINERAL RESERVES


N
SCALE
0
1/2
1 MILE
AVON PARK CUTOFF RD.
F.P.C. POWERLINE
BOWLEGS CREEK
PROPPS BRANCH
HART RD.
KELLER RD.
DESHEON RD.
MT. PISGAH RD.
US 17
PEACE RIVER
STEPHENS BRANCH
GURR RUN
GILSHEY BRANCH
COUNTY LINE RD.
LEGEND
BLM MINERAL RESERVES
OUTPARCELS (PRIVATELY OWNED)

7.7 REFERENCES

Bureau of Land Management. 1981a. Letter from Roger L. Hildebeidel, Eastern States Office Alexandria, Virginia, to Rebecca W. Hanmer, U.S. EPA Region IV, July 20, 1981.

Bureau of Land Management. 1981b. Letter from Roger L. Hildebeidel, Eastern States Office, Alexandria, Virginia to Charles R. Jeter, U.S. EPA Region IV, August 28, 1981.

Percy, G.W. 1980. Letter from George W. Percy, Deputy State Historic Preservation Officer, to A. Jean Tolman, U.S. EPA Region IV, December 16, 1980.

Saunders, L.H. 1981. Letter from Lloyd H. Saunders, Acting Chief, Planning Division, Jacksonville District, Corps of Engineers, to A. Jean Tolman, U.S. EPA Region IV, July 17, 1981.

U.S. Environmental Protection Agency. 1980a. Letter from A. Jean Tolman, U.S. EPA Region IV, to Don Palmer, U.S. Fish and Wildlife Service, Jacksonville, Florida, December 12, 1980.

U.S. Environmental Protection Agency. 1980b. Letter from A. Jean Tolman, U.S. EPA Region IV, to G.W. Percy, Deputy State Historic Preservation Officer, July 23, 1980.

U.S. Environmental Protection Agency. 1981a. Letter from A. Jean Tolman, U.S. EPA Region IV, to Donald Hankla, U.S. Fish and Wildlife Service, Jacksonville, Florida, May 19, 1980.

U.S. Environmental Protection Agency. 1981b. Letter from A. Jean Tolman, U.S. EPA Region IV, to Don Palmer, U.S. Fish and Wildlife Service, Jacksonville, Florida, June 5, 1981.

U.S. Environmental Protection Agency. 1981c. Letter from A. Jean Tolman, U.S. EPA Region IV, to Don Palmer, U.S. Fish and Wildlife Service, Jacksonville, Florida, July 16, 1981.

U.S. Environmental Protection Agency. 1981d. Letter from Charles R. Jeter, U.S. EPA Region IV, to Roger L. Hildebeidel, Bureau of Land Management, Eastern States Office, Alexandria, Virginia, July 31, 1981.

U.S. Fish and Wildlife Service. 1980. Letter from Donald J. Hankla, U.S. Fish and Wildlife Service Jacksonville, Florida, to A. Jean Tolman, U.S. EPA Region IV, December 18, 1980.

U.S. Fish and Wildlife Service. 1981. Letter from Donald J. Hankla, U.S. Fish and Wildlife Service Jacksonville, Florida, to A. Jean Tolman, U.S. EPA Region IV, August 18, 1981.

8.0 LIST OF PREPARERS

The following EPA officials participated in developing this DEIS.

Name	Responsibility
Robert B. Howard	Chief, EIS Preparation Section
A. Jean Tolman	EIS Project Officer
Lionel Alexander, III	NPDES Permit Coordinator
D. Brian Mitchell	Air Quality
Louis Nagler	Air Quality
Doyle Brittain	Air Quality
James E. Orban	Noise
A. Eugene Coker	Geology and Groundwater
H. Richard Payne	Radiation
Curtis F. Fehn	Groundwater
Thomas R. Cavinder	Surface Water
John T. Marlar	Surface Water
William L. Kruczynski	Biology and Ecology
Delbert B. Hicks	Biology and Ecology

For information on the material presented in this section, contact A. Jean Tolman at (404) 881-7458 (FTS/257-7458).

The Draft EIS for the Mobil South Fort Meade project was prepared by EPA with consultant assistance from Engineering-Science, Inc. (ES) of Atlanta, Georgia, using the third party EIS preparation method. The names and qualifications of the ES project team on this EIS are presented in Table 8.0-1. Data presented in the Draft EIS were gathered as a joint effort by the U.S. Environmental Protection Agency, Mobil Chemical Company, and the consultants listed in Table 8.0-2. ES was responsible for evaluating the plans and quality assurance provisions of the data gathering consultants. The data was provided to ES in an uninterpreted form.

TABLE 8.0-1

NAMES, RESPONSIBILITIES, AND QUALIFICATIONS OF PERSONS PRIMARILY RESPONSIBLE FOR PREPARING THE MOBIL DRAFT ENVIRONMENTAL IMPACT STATEMENT

Name	Responsibility	Qualifications
Andrew W. Loven	Principal-in-Charge	Ph.D. Physical Chemistry; Principal and Senior Vice President, Engineering-Science, Inc., 21 years experience including the direction of interdiscipline studies for environmental assessments and industrial facility siting studies.
Thomas N. Sargent	Project Director	M.S. Environmental Engineering; Associate and Manager of Engineering Development, Engineering-Science, Inc., 14 years experience in the direction of interdiscipline studies with emphasis in environmental studies and permit preparation.
Ernest J. Schroeder	Project Manager	M.S. Civil Environmental Engineering; Associate, Engineering-Science, Inc., 14 years experience in environmental studies with emphasis in plant siting and development of pollution abatement programs for industrial facilities.
Brian D. Moreth	Deputy Project Manager	B.S. Forest Science and B.S. Zoology; Project Scientist, Engineering-Science, Inc., 10 years experience in the preparation of environmental impact statements for a wide variety of projects including phosphate mines.
J. Kenneth Allison	Air Quality, Meteorology	M.S. Meteorology; Senior Meteorologist/Scientist, Engineering-Science, Inc., 28 years experience in environmental studies including meteorology, air quality and air diffusion including impact studies.
Frank R. Crum	Geology and Groundwater	B.S. Geology; Vice President and Director, Leggette, Brashears and Graham, Inc., 22 years experience in geological investigations and groundwater studies for projects including phosphate mining operations investigations.
Earnest F. Gloyna	Radiation	Dr. Eng. Sanitary Engineering and Water Resources; Special Consultant, Engineering-Science, Inc., 35 years experience in waste management including radioactive waste disposal consulting with National Academy of Sciences.
Benjiman W. Breedlove	Biology	M.S.P.H. Public Health and Environmental Biology; Principal, Breedlove Associates, Inc., 12 years experience in biological research studies including aquatic ecology, limnology, terrestrial ecology, water quality evaluations and ecosystem analyses.
Lial F. Tischler	Surface Water Radiation	Ph.D. Civil (Environmental Health) Engineering; Principal and Vice President, Engineering-Science, Inc., 17 years experience in water quality modeling and impact assessment, evaluation of radiological health impacts.
T.M. Gurr	Reclamation and Mine Plan Evaluation	M.A., Geology; Associate Scientist, Dames and Moore, 15 years experience in geological and mining studies in the Central Florida Phosphate District including mine planning, explanation, reclamation economic geology and environmental permitting.
Stephen C. Neeley	Human Resources	B.L.S. Environmental Management; Staff Scientist, Engineering-Science, Inc., 4 years experience in socio-economic (human resources) analyses preparation as part of comprehensive environmental studies.
Ruth E. Maclin	Editor	B.A. English; Editor, Engineering-Science, Inc., 3 years experience editing reports, manuals, and selected publications.

TABLE 8.0-2

ORGANIZATIONS RESPONSIBLE FOR GATHERING THE BASIC DATA USED IN PREPARING THE MOBIL DRAFT ENVIRONMENTAL IMPACT STATEMENT*

ORGANIZATION	AREA(S) OF RESPONSIBILITY
Dames & Moore Lakeland, FL	Surface Water Soils and Geology
Geraghty & Miller, Inc. Tampa, FL	Groundwater
Post, Buckley, Schuh & Jernigan Orlando, FL	Groundwater Radiation
NUS Corporation Rockville, MD	Human Resources Archaeology
Water and Air Research, Inc. Gainesville, FL	Biology
Zellars-Williams, Inc. Lakeland, FL	Soils and Geology
Environmental Science and Engineering, Inc. Gainesville, FL	Air

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*The data gathering effort was overseen by Engineering-Science, Inc. of Atlanta, Georgia, the third party consultant working under contract to the U.S. Environmental Protection Agency.

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    Overburden/Clay Mix Case: 2-58; 3-16, 31, 64, 81, 105, 148
    Sand/Clay Cap Case: 2-44, 80; 3-16, 30, 58, 80, 104, 147
    Sand/Clay Mix Case: 2-50; 3-16, 30, 61, 80, 104, 147

Water Discharge
    Peace River: 2-115; 3-112, 154
    Bowlegs Creek: 2-115; 3-116, 154

Water Sources
    Groundwater: 2-111; 3-39, 85, 111, 153
    Surface Water: 2-112; 3-39, 86, 112, 153

Wetlands: 2-119; 3-131, 142;

APPENDIX
DRAFT NPDES PERMIT

Permit No.: FL0037958

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, as amended (33 U.S.C. 1251 et. seq; the "Act"),

Mobil Chemical Co. - South Fort Meade Mine

is authorized to discharge from a facility located at

Latitude - 27° 39' 26"

Longitude - 81° 46' 08"

DRAFT

to receiving waters named

The Peace River

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof. The permit consists of this cover sheet, Part I _3_ pages(s), Part II _12_ page(s) and Part III _6_ page(s).

This permit shall become effective on

This permit and the authorization to discharge shall expire at midnight,

Date Signed

Howard D. Zeller
Acting Director
Enforcement Division

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on the effective date of this permit and lasting through the term of this permit, the permittee is authorized to discharge from outfall(s) serial number(s) 001 - process generated wastewater.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Units (Specify)			
	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency (during discharge)	Sample Type
Flow—m³/Day (MGD)	—	—	—	—	Continuous**	Recorder
Total Suspended Solids	--	--	30 mg/l	60 mg/l	1/week	Composite
Specific Conductance	--	--	550 µmhos/cm	1000 µmhos/cm	1/week	Composite
Radium*	--	--	5 pci/l	10 pci/l	1/week	Composite

*Combined Radium 226 & 228

The pH shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored once per week with a grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): nearest accessible point after final treatment but prior to actual discharge or mixing with the receiving waters.

**The discharge flow shall not exceed 20 percent the flow in the Peace River.

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Any overflow from facilities designated, constructed and maintained to contain or treat the volume of wastewater which would result from a "10-year, 24-hour precipitation event shall not be subject to the suspended solids limitation or the pH limitation listed on the preceeding pages. Monitoring and reporting shall be required for all other parameters.

The effluent limits and any additional requirements specified in the state certification supersede any less stringent effluent limits listed above. During any time period in which more stringent state certification effluent limits are stayed or inoperable, the effluent limits listed above shall be in effect and fully enforceable.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

    2. The permittee shall comply with the effluent limits by the effective date of the permit.

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

A. MANAGEMENT REQUIREMENTS

1. Discharge Violations

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than, or at a level in excess of, that identified and authorized by this permit constitutes a violation of the terms and conditions of this permit. Such a violation may result in the imposition of civil and/or criminal penalties as provided in Section 309 of the Act.

2. Change in Discharge

Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application at least 180 days prior to commencement of such discharge. Any other activity which would constitute cause for modification or revocation and reissuance of this permit, as described in Part II (B) (4) of this permit, shall be reported to the Permit Issuing Authority.

3. Noncompliance Notification

a. Instances of noncompliance involving toxic or hazardous pollutants should be reported as outlined in Condition 3c. All other instances of noncompliance should be reported as described in Condition 3b.

b. If for any reason, the permittee does not comply with or will be unable to comply with any discharge limitation specified in the permit, the permittee shall provide the Permit Issuing Authority with the following information at the time when the next Discharge Monitoring Report is submitted.

(1) A description of the discharge and cause of noncompliance;
(2) The period of noncompliance, including exact dates and times and/or anticipated time when the discharge will return to compliance; and
(3) Steps taken to reduce, eliminate, and prevent recurrence of the noncomplying discharge.

c. Toxic or hazardous discharges as defined below shall be reported by telephone within 24 hours after permittee becomes aware of the circumstances and followed up with information in writing as set forth in Condition 3b. within 5 days, unless this requirement is otherwise waived by the Permit Issuing Authority:

(1) Noncomplying discharges subject to any applicable toxic pollutant effluent standard under Section 307(a) of the Act;
(2) Discharges which could constitute a threat to human health, welfare or the environment. These include unusual or extraordinary discharges such as those which could result from bypasses, treatment failure or objectionable substances passing through the treatment plant. These include Section 311 pollutants or pollutants which could cause a threat to public drinking water supplies.

d. Nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

4. Facilities Operation

All waste collection and treatment facilities shall be operated in a manner consistent with the following:

a. The facilities shall at all times be maintained in a good working order and operated as efficiently as possible. This includes but is not limited to effective performance based on design facility removals, adequate funding, effective management, adequate operator staffing and training, and adequate laboratory and process controls (including appropriate quality assurance procedures); and

b. Any maintenance of facilities, which might necessitate unavoidable interruption of operation and degradation of effluent quality, shall be scheduled during noncritical water quality periods and carried out in a manner approved by the Permit Issuing Authority.

c. The permittee, in order to maintain compliance with this permit shall control production and all discharges upon reduction, loss, or failure of the treatment facility until the facility is restored or an alternative method of treatment is provided.

5. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to waters of the United States resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature of the noncomplying discharge.

6. **Bypassing**

"Bypassing" means the intentional diversion of untreated or partially treated wastes to waters of the United States from any portion of a treatment facility. Bypassing of wastewaters is prohibited unless all of the following conditions are met:

a. The bypass is unavoidable-i.e. required to prevent loss of life, personal injury or severe property damage;

b. There are no feasible alternatives such as use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment down time;

c. The permittee reports (via telephone) to the Permit Issuing Authority any unanticipated bypass within 24 hours after becoming aware of it and follows up with written notification in 5 days. Where the necessity of a bypass is known (or should be known) in advance, prior notification shall be submitted to the Permit Issuing Authority for approval at least 10 days beforehand, if possible. All written notifications shall contain information as required in Part II (A)(3)(b); and

d. The bypass is allowed under conditions determined to be necessary by the Permit Issuing Authority to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration to the extent feasible.

This requirement is waived where infiltration/inflow analyses are scheduled to be performed as part of an Environmental Protection Agency facilities planning project.

7. **Removed Substances**

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering waters of the United States.

8. Power Failures

The permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated or inadequately treated wastes during electrical power failures either by means of alternate power sources, standby generators or retention of inadequately treated effluent. Should the treatment works not include the above capabilities at time of permit issuance, the permittee must furnish within six months to the Permit Issuing Authority, for approval, an implementation schedule for their installation, or documentation demonstrating that such measures are not necessary to prevent discharge of untreated or inadequately treated wastes. Such documentation shall include frequency and duration of power failures and an estimate of retention capacity of untreated effluent.

9. Onshore or Offshore Construction

This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any waters of the United States.

B. RESPONSIBILITIES

1. Right of Entry

The permittee shall allow the Permit Issuing Authority and/or authorized representatives (upon presentation of credentials and such other documents as may be required by law) to:

a. Enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit;

b. Have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit;

c. Inspect at reasonable times any monitoring equipment or monitoring method required in this permit;

d. Inspect at reasonable times any collection, treatment, pollution management or discharge facilities required under the permit; or

e. Sample at reasonable times any discharge of pollutants.

2. Transfer of Ownership or Control

A permit may be transferred to another party under the following conditions:

a. The permittee notifies the Permit Issuing Authority of the proposed transfer;

b. A written agreement is submitted to the Permit Issuing Authority containing the specific transfer date and acknowledgement that the existing permittee is responsible for violations up to that date and the new permittee liable thereafter.

Transfers are not effective if, within 30 days of receipt of proposal, the Permit Issuing Authority disagrees and notifies the current permitttee and the new permittee of the intent to modify, revoke and reissue, or terminate the permit and to require that a new application be filed.

3. Availability of Reports

Except for data determined to be confidential under Section 308 of the Act, (33 U.S.C. 1318) all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Permit Issuing Authority. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act (33 U.S.C. 1319).

4. Permit Modification

After notice and opportunity for a hearing, this permit may be modified, terminated or revoked for cause (as described in 40 CFR 122.15 et seq) including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts;

c. A change in any condition that requires either temporary interruption or elimination of the permitted discharge; or

d. Information newly acquired by the Agency indicating the discharge poses a threat to human health or welfare.

If the permittee believes that any past or planned activity would be cause for modification or revocation and reissuance under 40 CFR 122.15 et seq, the permittee must report such information to the Permit Issuing Authority. The submission of a new application may be required of the permittee.

5. Toxic Pollutants

a. Notwithstanding Part II (B)(4) above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge authorized herein and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revoked and reissued or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

b. An effluent standard established for a pollutant which is injurious to human health is effective and enforceable by the time set forth in the promulgated standard, even though this permit has not as yet been modified as outlined in Condition 5a.

6. Civil and Criminal Liability

Except as provided in permit conditions on "Bypassing", Part II (A) (6), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act (33 U.S.C. 1321).

8. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

10. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

11. Permit Continuation

A new application shall be submitted at least 180 days before the expiration date of this permit. Where EPA is the Permit Issuing Authority, the terms and conditions of this permit are automatically continued in accordance with 40 CFR 122.5, provided that the permittee has submitted a timely and sufficient application for a renewal permit and the Permit Issuing Authority is unable through no fault of the permittee to issue a new permit before the expiration date.

C. MONITORING AND REPORTING

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Reporting

Monitoring results obtained during each calendar month shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1). Forms shall be submitted at the end of each calendar quarter and shall be postmarked no later than the 28th day of the month following the end of the quarter. The first report is due by the 28th day of the month following the first full quarter after the effective date of this permit.

Signed copies of these, and all other reports required herein, shall be submitted to the Permit Issuing Authority at the following address(es):

Permit Compliance Branch
Environmental Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Florida Department of Environmenta
Regulation
Division of Environmental Programs
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

3. Test Procedures

Test procedures for the analysis of pollutants shall conform to all regulations published pursuant to Section 304(h) of the Clean Water Act, as amended (40 CFR 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants").

4. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date, and time of sampling;

b. The person(s) who obtained the samples or measurements;

c. The dates the analyses were performed;

d. The person(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of all required analyses.

5. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA No. 3320-1). Such increased frequency shall also be indicated.

6. Records Retention

The permittee shall maintain records of all monitoring including: sampling dates and times, sampling methods used, persons obtaining samples or measurements, analyses dates and times, persons performing analyses, and results of analyses and measurements. Records shall be maintained for three years or longer if there is unresolved litigation or if requested by the Permit Issuing Authority.

D. DEFINITIONS

1. Permit Issuing Authority

The Regional Administrator of EPA Region IV or designee.

2. Act

"Act" means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act) Public Law 92-500, as amended by Public Law 95-217 and Public Law 95-576, 33 U.S.C. 1251 et seq.

3. Mass/Day Measurements

a. The "average monthly discharge" is defined as the total mass of all daily discharges sampled and/or measured during a calendar month on which daily discharges are sampled and measured, divided by the number of daily discharges sampled and/or measured during such month. It is, therefore, an arithmetic mean found by adding the weights of the pollutant found each day of the month and then dividing this sum by the number of days the tests were reported. This limitation is identified as "Daily Average" or "Monthly Average" in Part I of the permit and the average monthly discharge value is reported in the "Average" column under "Quantity" on the Discharge Monitoring Report (DMR).

b. The "average weekly discharge" is defined as the total mass of all daily discharges sampled and/or measured during a calendar week on which daily discharges are sampled and/or measured divided by the number of daily discharges sampled and/or measured during such week. It is, therefore, an arithmetic mean found by adding the weights of pollutants found each day of the week and then dividing this sum by the number of days the tests were reported. This limitation is identified as "Weekly Average" in Part I of the permit and the average weekly discharge value is reported in the "Maximum" column under "Quantity" on the DMR.

c. The "maximum daily discharge" is the total mass (weight) of a pollutant discharged during a calendar day. If only one sample is taken during any calendar day the weight of pollutant calculated from it is the "maximum daily discharge". This limitation is identified as "Daily Maximum," in Part I of the permit and the highest such value recorded during the reporting period is reported in the "Maximum" column under "Quantity" on the DMR.

4. Concentration Measurements

a. The "average monthly concentration," other than for fecal coliform bacteria, is the concentration of all daily discharges sampled and/or measured during a calendar month on which daily discharges are sampled and measured divided by the number of daily discharges sampled and/or measured during such month (arithmetic mean of the daily concentration values). The daily concentration value is equal to the concentration of a composite sample or in the case of grab samples is the arithmetic mean (weighted by flow value) of all the samples collected during that calendar day. The average monthly count for fecal coliform bacteria is the geometric mean of the counts for samples collected during a calendar month. This limitation is identified as "Monthly Average" or "Daily Average" under "Other Limits" in Part I of the permit and the average monthly concentration value is reported under the "Average" column under "Quality" on the DMR.

b. The "average weekly concentration," other than for fecal coliform bacteria, is the concentration of all daily discharges sampled and/or measured during a calendar week on which daily discharges are sampled and measured divided by the number of daily discharges sampled and/or measured during such week (arithmetic mean of the daily concentration values). The daily concentration value is equal to the concentration of a composite sample or in the case of grab samples is the arithmetic mean (weighted by flow value) of all samples collected during that calendar day. The average weekly count for fecal coliform bacteria is the geometric mean of the counts for samples collected during a calendar week. This limitation is identified as "Weekly Average" under "Other Limits" in Part I of the permit and the average weekly concentration value is reported under the "Maximum" column under "Quality" on the DMR.

c. The "maximum daily concentration" is the concentration of a pollutant discharged during a calendar day. It is identified as "Daily Maximum" under "Other Limits" in Part I of the permit and the highest such value recorded during the reporting period is reported under the "Maximum" column under "Quality" on the DMR.

5. Other Measurements

   a. The effluent flow expressed as M^3/day (MGD) is the 24 hour average flow averaged monthly. It is the arithmetic mean of the total daily flows recorded during the calendar month. Where monitoring requirements for flow are specified in Part I of the permit the flow rate values are reported in the "Average" column under "Quantity" on the DMR.

   b. Where monitoring requirements for pH, dissolved oxygen or fecal coliform are specified in Part I of the permit the values are generally reported in the "Quality or Concentration" column on the DMR.

6. Types of Samples

   a. Composite Sample - A "composite sample" is any of the following:

      (1) Not less than four influent or effluent portions collected at regular intervals over a period of 8 hours and composited in proportion to flow.

      (2) Not less than four equal volume influent or effluent portions collected over a period of 8 hours at intervals proportional to the flow.

      (3) An influent or effluent portion collected continuously over a period of 24 hours at a rate proportional to the flow.

   b. Grab Sample: A "grab sample" is a single influent or effluent portion which is not a composite sample. The sample(s) shall be collected at the period(s) most representative of the total discharge.

7. Calculation of Means

   a. Arithmetic Mean: The arithmetic mean of any set of values is the summation of the individual values divided by the number of individual values.

   b. Geometric Mean: The geometric mean of any set of values is the Nth root of the product of the individual values where N is equal to the number of individual values. The geometric mean is equivalent to the antilog of the arithmetic mean of the logarithms of the individual values. For purposes of calculating the geometric mean, values of zero (0) shall be considered to be one (1).

c. Weighted by Flow Value: Weighted by flow value means the summation of each concentration times its respective flow divided by the summation of the respective flows.

8. Calendar Day

a. A calendar day is defined as the period from midnight of one day until midnight of the next day. However, for purposes of this permit, any consecutive 24-hour period that reasonably represents the calendar day may be used for sampling.

PART III

OTHER REQUIREMENTS

A. In accordance with Section 306(d) of the Federal Water Pollution Control Act (PL 92-500) the standards of performance for conventional Pollutions as contained in this permit shall not be made any more stringent during a ten year period beginning on the date of completion of construction or during the period of depreciation of amortization of such facility for the purposes of Section 167 or 169 (or both) of the Internal Revenue Code of 1954, whichever period ends first. The provisions of Section 306(d) do not limit the authority of the Environmental Protection Agency to modify the permit to require compliance with a toxic effluent limitation. Promulgated under BAT or Toxic Pollutant Standard established under Section 307(a) of the FWPCA.

B. National Environmental Policy Act (NEPA) Requirements

The below listed requirements, conditions and limitations were recommended in the site specific Environmental Impact Statement for the Mobil Chemical Company South Fort Meade Mine, and are hereby incorporated into National Pollutant Discharge Elimination System Permit No. FL0037958 in accordance with 40 CFR 122.62(d)(9).

1. Mobil shall employ the sand/clay cap waste disposal plan and the sand/clay cap reclamation plan described in the EIS and identified as EPA's preferred alternatives for waste disposal and reclamation.
2. Mobil shall employ high profile overburden stacking in the mining of the area covered by Clay Settling Area 10 (CS-10) to the maximum extent compatible with toe spoiling of the leach zone. If any increase in waste storage volume is realized by the use of this technique, it shall be reflected in a lower reclaimed elevation for the area rather than an increase in clay storage within CS-10.
3. Mobil shall meet the requirements of its Southwest Florida Water Management District (SWFWMD) Consumptive Use Permit.
4. Mobil shall provide storage that allows recirculation of water recovered from slimes. The water circulation system and storage capacity shall be as described in the EIS for Mobil's proposed project.

5. During the dragline mining activity, Mobil shall, in accordance with its proposed action in the EIS, employ the technique of leach zone management by toe spoiling, i.e., overburden from near the interface with the matrix shall be placed at the toe of the spoil pile and covered with overburden from upper strata.

6. Mobil shall meet county and state reclamation requirements.

7. Mobil shall preserve from mining, or any other disturbance not essential to and unavoidable for the mining operation, the areas designated for preservation in Mobil's proposed action in the EIS. Specifically, the total of 1094 acres thus preserved shall include a minimum of 182 acres of cutover flatwoods, 664 acres of upland hardwood forest, 5 acres of upland mixed forest, 111 acres of freshwater swamp, and 21 acres of freshwater marsh, all in the locations depicted in the attached Figure 1.

8. Before beginning any land-disturbing activities, Mobil shall develop a program whereby indigo snakes encountered in the work area are captured and turned over to the FGFWFC Endangered Species Coordinator for relocation to other suitable habitats in the region. (The technique for handling and keeping this species until the FGFWFC arrives is to place the snake in a cloth sack, out of the sun, preferably in an air conditioned building.) The program shall include informing Mobil workers of the importance of the indigo snake, familiarizing them with its appearance and instructing them as to its preservation. In addition, the gopher tortoise population in the site area shall be protected to the extent possible. Mobil shall maintain a record of the program to be submitted to the U.S. Fish and Wildlife Service office in Jacksonville, Florida.

9. Mobil shall not conduct any mining, or any activity associated with its mining operation, within 1500 feet in any direction of the bald eagle nest located in T32S, R26E, Section 9. Beginning four years prior to site preparation activities preceding mining of the areas closest to the eagle nest (to the east, south and west), Mobil shall provide for a field study to be performed by a qualified biologist to determine the area(s) being utilized for feeding by the eagles. Observations shall be conducted from January 1st through April 15 of the specified year. Since young may or may not be produced in any given year, Mobil shall attempt to provide data for at least one successful nestling period during the referenced four

years. Specifics of the study shall be coordinated with and reviewed by the USF&WS office in Jacksonville, Florida. If it appears at the onset of the study year that the subject eagle nest is no longer in existence, that fact must be confirmed by a letter from the USF&WS. If the results of the study reveal that the eagles are utilizing an area on the Mobil property for feeding, Mobil shall preserve that area from disturbance.

10. Mobil shall comply with the categorization of wetlands present on the mine property as set forth in the EIS and illustrated in Figure 2, attached. In summary, within Category 1 wetlands, Mobil shall not mine, shall limit activities to those essential to and unavoidable for the mining operation, and shall otherwise take all reasonable measures to preserve all Category 1 wetlands. In addition, Mobil shall restore the total acreage of Category 2 wetlands disturbed by mining.

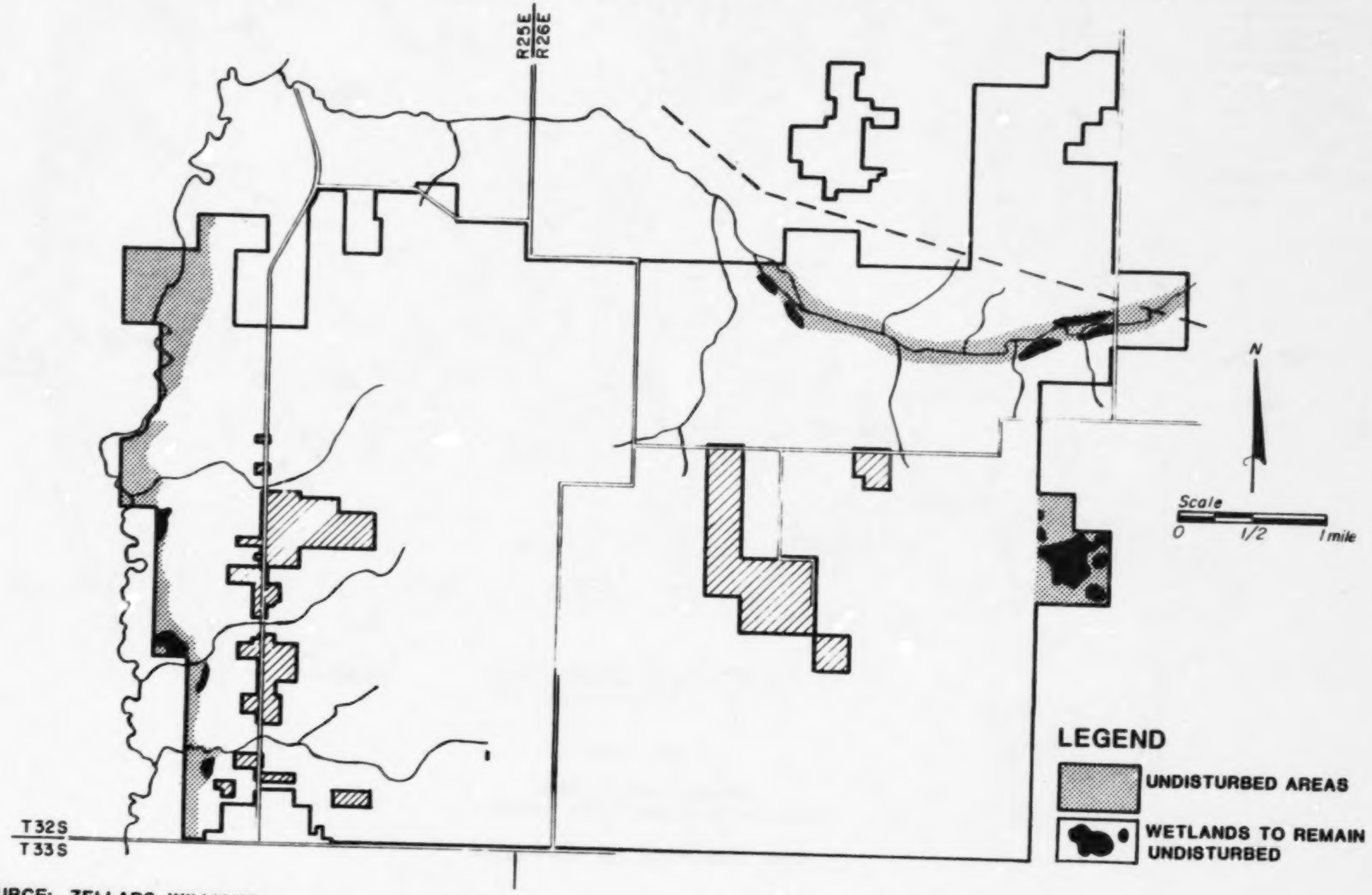
11. Mobil shall conduct a monitoring program to assess the wetlands restoration and re-creation effort at the South Fort Meade Mine. Three wetland re-creation areas (a depression wetland in area CS-1, the reforested stream channel of Maron Run, and the forested wetland in area CS-14) shall be monitored for one year according to the following program: (1) Beginning 12 weeks after completion of the reclamation of each respective area, the water level shall be monitored biweekly; and (2) Following the first full growing season, a biological assessment shall be performed by a degreed biologist for each of the three areas; the assessment shall include a listing of wetland plant species present, mapping of their location, a visual estimate of the amount of cover provided by the wetland species, and sampling of the benthic macroinvertebrates to yield a list of the species collected and their density. After the above-described monitoring program is performed for both the sand/clay depression area and the forested stream channel, one area shall be selected by EPA for long-term monitoring by Mobil. This long-term monitoring program shall consist of a yearly biological assessment by a degreed biologist to include the items in (2) above. In addition, in order to determine the degree of subsidence occurring, if any, the maximum depth of the marsh depression area relative to a fixed elevation point shall be monitored quarterly for the life of this permit. Mobil shall submit annual reports of the described monitoring program to the EPA Region IV Ecology Branch.

12. During the mining activities conducted near the Bowlegs Creek preserved area, Mobil shall monitor the Shallow Aquifer to assess the effectiveness of the perimeter ditch in preventing dewatering of the preserved area. This monitoring program shall consist of using the existing well #SA-3 to perform weekly manual water level measurements during the first sixteen weeks of mining near Bowlegs Creek and monthly thereafter until the mining pit immediately adjacent to the preserved area is closed. Mobil shall not allow the Shallow Aquifer in this preserved area to be lowered more than three feet due to the mining activites.

13. Unless specified otherwise by a preceding condition in this permit, Mobil shall perform its mining project in complete accordance with the applicant's proposed action described and evaluated in the Mobil South Fort Meade Mine EIS and Supplemental Information Document (SID), including the employment of all mitigating measures presented as part of the proposed action. However, this shall not preclude the imposition of any additional or more stringent conditions which may be required by any local or state regulatory agency or governmental entity.

Figure 1

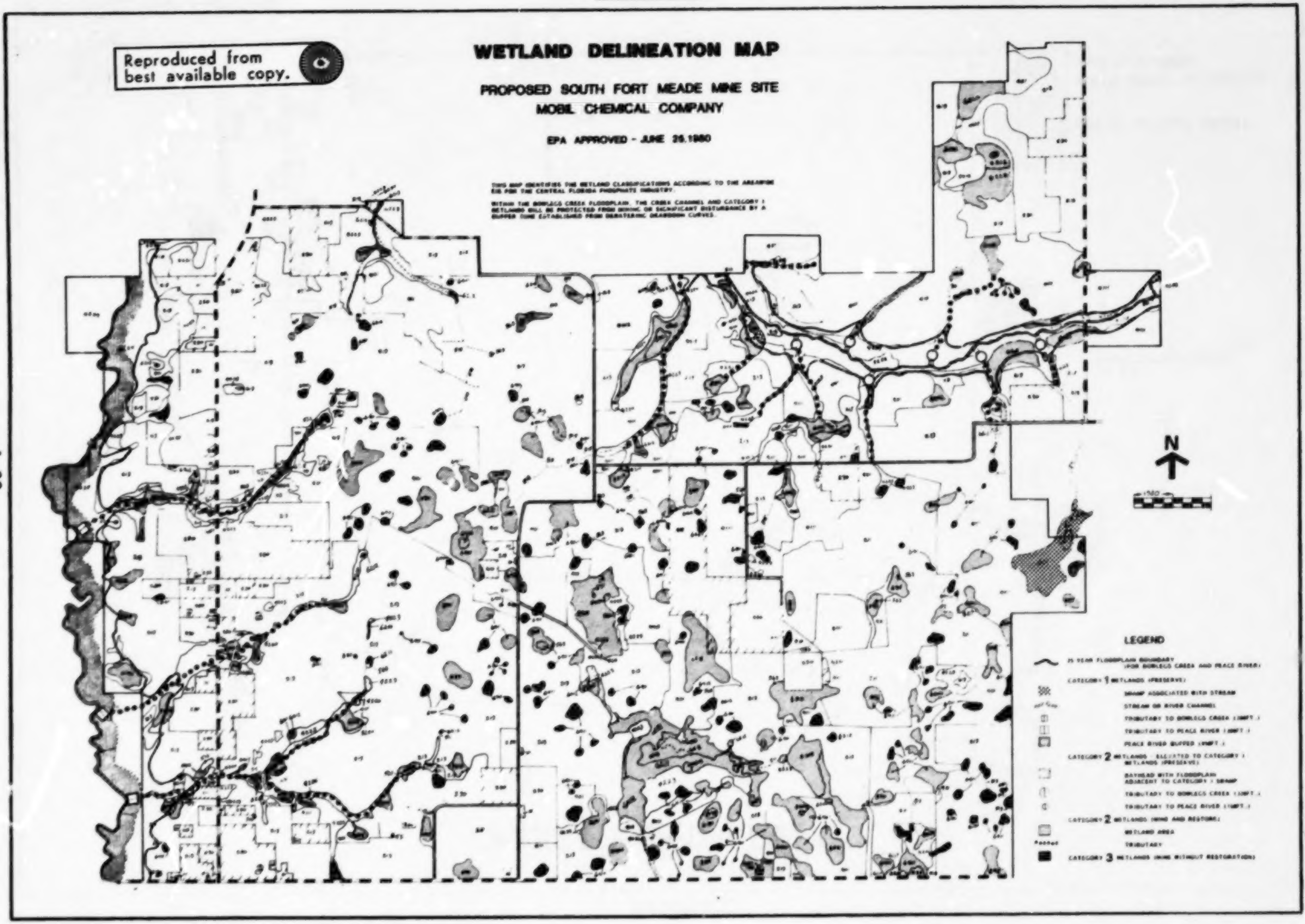
UNDISTURBED AREAS


R25E
R26E
T32S
T33S
N
Scale
0
1/2
1 mile
LEGEND
▨ UNDISTURBED AREAS
● WETLANDS TO REMAIN UNDISTURBED

SOURCE: ZELLARS-WILLIAMS

Figure 2

Reproduced from best available copy.



WETLAND DELINEATION MAP

PROPOSED SOUTH FORT MEADE MINE SITE
MOBIL CHEMICAL COMPANY

EPA APPROVED - JUNE 25,1980

THIS MAP IDENTIFIES THE WETLAND CLASSIFICATIONS ACCORDING TO THE AREAWIDE EIS FOR THE CENTRAL FLORIDA PHOSPHATE INDUSTRY.

WITHIN THE BOWLEGS CREEK FLOODPLAIN, THE CREEK CHANNEL AND CATEGORY 1 WETLANDS WILL BE PROTECTED FROM MINING OR SIGNIFICANT DISTURBANCE BY A BUFFER ZONE ESTABLISHED FROM DEWATERING DRAWDOWN CURVES.

N
1500
LEGEND
25 YEAR FLOODPLAIN BOUNDARY (FOR BOWLEGS CREEK AND PEACE RIVER)
CATEGORY 1 WETLANDS (PRESERVE)
SWAMP ASSOCIATED WITH STREAM
STREAM OR RIVER CHANNEL
TRIBUTARY TO BOWLEGS CREEK (UNPT.)
TRIBUTARY TO PEACE RIVER (UNPT.)
PEACE RIVER BUFFER (UNPT.)
CATEGORY 2 WETLANDS - ELEVATED TO CATEGORY 1 WETLANDS (PRESERVE)
BAYHEAD WITH FLOODPLAIN ADJACENT TO CATEGORY 1 SWAMP
TRIBUTARY TO BOWLEGS CREEK (UNPT.)
TRIBUTARY TO PEACE RIVER (UNPT.)
CATEGORY 2 WETLANDS (MINE AND RESTORE)
WETLAND AREA
TRIBUTARY
CATEGORY 3 WETLANDS (MINE WITHOUT RESTORATION)